The Dissertation Committee for Wesley David Wynne certifies that this is the approved version of the following dissertation:

An Investigation of Ethnic and Gender Intercept Bias in the SAT's Prediction of College Freshman Academic Performance

Committee:

____
Joseph M. Horn, Supervisor

____
Clarke A. Burnham

____
David J. Drum

____
Carl L. Helmreich

____
Marc S. Lewis

An Investigation of Ethnic and Gender Intercept Bias in the SAT's Prediction of College Freshman Academic Performance

by

Wesley David Wynne, B.A., M.S.

Dissertation

Presented to the Faculty of the Graduate School of
The University of Texas at Austin
in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

The University of Texas at Austin

August 2003

Dedication

With deepest gratitude to

Charles Wiley, Dick Benson, and Stan Ridgley—friends and mentors

Acknowledgements

A great many people aided in the production of this dissertation, as providers of moral support, material effort, or technical guidance. No one was more valuable to this work than my primary advisor, Joe Horn, who was important in all of those areas, and who also provided the original idea that became the focus of the study. I am also most grateful of the inspiration provided by friends Charles Wiley and Dick Benson, who never ceased to guide me toward the completion of the Ph.D. despite my engagement with many other activities in my years living away from Austin. Devendra Singh and the late Lee Willerman deserve special mention for their early encouragement, as well.

Members of my family, particularly my mother Evelyn Jones Wynne and my dear cousin Elizabeth Gibson, were sources of assistance and motivation, as were Blaine Peterson and Miriam Pincus. More than anyone, my maternal grandmother—Opia Viola Stewart Jones (1904-1994)—made possible this effort and anything I might ever accomplish. Her enduring love is the *sine qua non* of my existence.

Colleagues Jeremy Beer, Rick Arnold, and Xandy Gilman all deserve credit for their kindness. Rick helped me address some of the design issues while he was still in Texas. Jeremy I thank for his professional editorial review of a late version of the manuscript. Xandy Gilman toiled with me for many hours over a range of pedestrian tasks, from stuffing envelopes to entering data, all the while providing the special comfort of companionship and laughter that only she can give. Our mutual friend Britt Bjorklund aided in these tiresome chores also, and I thank her.

Stan Ridgley was monumentally important during the two years he served as my supervisor at the Intercollegiate Studies Institute. Having just completed a long-distance dissertation himself, he was more than empathetic with my needs and willing to help in any way he could. At one key point, he played an especially critical role. Likewise, I am most grateful to Mike Ratliff and the Intercollegiate Studies Institute itself for contributing major funding to the completion of the survey mailings, which would have otherwise proved financially onerous.

The literature review was conducted at a surprising large number of institutions, owing to my peripatetic lifestyle over the last few years. The University of Texas library system, one of the largest and best in the world, was indispensable. Research was also enabled by Southwest Texas State University, Trinity University, the University of Texas at San Antonio, the University of Delaware, Princeton, the University of Michigan, and Cornell. I thank the trustees and staff of those institutions for making it possible for some of my work to be accomplished with the help of resources at those schools.

Many of my statistical questions were answered patiently by not only the members of my committee but also by Pat Randall and John Loehlin at UT. Further advice was provided by Linda Gottfredson and Joe Glutting of the University of Delaware. In the final stages of analysis, Charles Hansford, formerly of Texas Tech, provided crucial advice. My gratitude extends to all of them.

Members of the University staff who work in the registrar's office and the Measurement and Evaluation Center capably and kindly provided student data critical to the study. I thank Gary Hansen, Linda Hardwick, and Carl Hehmsoth for their time and effort spent on the project.

As for Clarke Burnham, one could simply not dream of a more considerate and compassionate graduate advisor. It would not be possible for me to recall all the times Clarke came through when I needed help, whether regarding TA support, IRB issues, or any of a host of other matters. He is truly one of a kind.

Other educational figures from my past also deserve special mention. Warren Holmes, my thesis advisor at the University of Michigan, will always be a role model for his consistent professionalism and compassion expressed during my two years under his tutelage. And the recently deceased George Brazell, who taught my introductory psychology class so many years ago—his attention and friendship will never be forgotten. I am ever grateful also to William Culverhouse, my biology and chemistry teacher at Eastland High School, who did me the great favor of introducing me to the University of Texas at Austin. And of course, finally there is the beloved Barbara Hurst, who was truly the first to introduce me to psychology, way back at Frederick High School. She is my ultimate inspiration for pursuing the Ph.D.

An Investigation of Ethnic and Gender Intercept Bias in the SAT's Prediction of College Freshman Academic Performance

Publication No. ____________

Wesley David Wynne, Ph.D.

The University of Texas at Austin, 2003

Supervisor: Joseph M. Horn

Intercept bias in the SAT's prediction of college freshman academic performance has long been found in studies evaluating the academic prediction of men and women, and various ethnic groups. Typically the college GPAs of women are underpredicted relative to men by approximately 2/10th of a standard deviation in GPA. In multicultural samples, relative to Whites, Asian American freshman performance is often underpredicted by a similar amount, and the performance of Blacks and Hispanics is overpredicted.

The hypothesis of the study presented herein was that this differential prediction can be explained by a set of behavioral and attitudinal variables; i.e., that the inclusion of such variables into the prediction equation alongside SAT would result in the diminishment or elimination of observed differential prediction. It was also hypothesized that use of a GPA adjusted for differences in grading standards that exist across college disciplines and courses would contribute to the reduction of differential prediction.

SAT scores, high school performance data, college grades and survey responses were obtained from a diverse sample of over nine hundred students at a large public university in the American Southwest. The data indicated that Asian American performance was not underpredicted by the SAT in this sample, although as anticipated, female performance was underpredicted and Mexican-American performance was overpredicted. Inadequate sample size precluded the analysis of African American students.

In relation to the hypothesis, results were mixed. Although inclusion of the additional variables and the use of the adjusted GPA criterion did not significantly reduce Mexican-American overprediction, it reduced the underprediction of women's performance to insignificance.

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Chapter I: Bias in the SAT's Prediction of College Freshman Grades: Context and Prior Findings

OVERVIEW

As a predictor of college grades, the Scholastic Assessment Test (since 1993 known officially as the SAT I: Reasoning Test) is found to exhibit a type of test bias—intercept bias—in the context of both ethnicity and gender. The freshman college grade average (GPA) of Asian-Americans is underpredicted relative to Whites, Hispanics and Blacks, and the freshman GPA of women is underpredicted relative to men, and the Among Asian-Americans, Whites, Hispanics and Blacks who attain the same SAT scores, Asian-Americans will attain a GPA approximately one tenth of a standard deviation higher than Whites, one quarter of a standard deviation higher than Hispanics, and four-tenths of a standard deviation higher than Blacks (Ramist, Lewis, & McCamley-Jenkins, 1994). Among men and women who achieve the same scores on the SAT, women will on average attain a GPA one quarter of a standard deviation higher than the men. Similar patterns of ethnic and gender intercept bias exist with other predictive tests and other criteria, in both educational and non-educational settings.

As a matter of practical concern for college admissions officers, the intercept bias of the SAT is mitigated by using high school percentile rank

(HSPR) or grade point average (HSGPA) in addition to SAT scores. A prediction equation that includes both SAT and HSPR or HSGPA reduces the intercept bias by up to half, and in the gender context, some of the remaining bias is explained by differences in college curriculum chosen by men and women the and corresponding differences in grading standards across disciplines (Ramist et al., 1994).

However, significant intercept bias, especially in the ethnic context remains unaccounted for. Relative to Asian-Americans, the combination of SAT and HSGPA was found in one large meta-analysis to overpredict college grades of Whites, Hispanics and Blacks by between .2 and .4 standard deviations. The effect was most pronounced in college math, the physical sciences and engineering (Ramist et al., 1994). The present study focuses on intercept bias among Asian-American and non-Asian-American freshmen at the University of Texas who major in sciences, engineering, and business—i.e., disciplines in which students are most likely to take quantitative courses. The central hypothesis of the study is that a set of education-related social-cognitive variables that differ among ethnic groups will, when included in the SAT-HSPR prediction equation, reduce or eliminate intercept bias. Further, because the dataset allowed for the analysis of gender-related intercept bias, an investigation of that phenomenon was amended as a purpose of the study.

ORIGINS OF MENTAL TESTING IN COLLEGE ADMISSIONS

The use of standardized psychometric tests in U.S. college admissions dates to the 1920s with the development and introduction of the SAT. Before that, college entrance exams were typically essay tests that covered content areas such as classics, Latin, Greek, and ancient history—subjects that were not as frequently taught in the public high schools from which most middle and lower class applicants graduated. Incorporating into the admissions process a selection tool such as the SAT, which did not depend as heavily on access to elite secondary education, was expected to enhance the educational opportunities of less socially advantaged applicants (Resnick, 1982). Because the SAT tested verbal and mathematical content that was much more widely taught in public high schools around the country (Jencks & Crouse, 1982), it served to provide colleges with a more uniform measure with which to compare applicants while at the same time minimizing considerations more closely related to social rank.

Reliance on the SAT would also advantage applicants who previously might have been denied entrance on the basis of ethnicity and religion (Snyderman & Rothman, 1988). Although some of testing's pioneers, including Carl Brigham, who was the guiding force behind the SAT's development, held mistaken views about the mental abilities of different ethnic groups, the falsehood of those misconceptions was eventually revealed by mental tests themselves, including even the SAT. Whereas, for example, Brigham concluded after examining IQ data from World War I army recruits that Asians and Jews are less gifted in comparison to Anglo-Saxons (Brigham, 1923), the former groups in fact do as well as or better than Anglo-Saxons on the SAT and other mental tests.

TEST BIAS

A Brief History

Though concerns over bias in the SAT are still expressed (e.g., Rooney, 1998; Fleming & Garcia, 1998; Owen, 1985; Rosser, 1989), a great amount of psychometric research over the past 35 years has found that the most serious concerns about unfair discrimination which might arise from the proper use of the SAT and similar tests are unwarranted. Many questions have been investigated regarding tests used in academic and occupational selection. Are minority members fairly served by the tests? Can the tests fairly assess poor persons, whose educational preparation is often less adequate than the typical college applicant? Are the items used on the tests fair to persons who are not from the American cultural mainstream? Do the scores obtained by test takers from minority groups predict performance as well as scores for members of the majority? These and related issues have stirred voluble debate and voluminous investigation in the social sciences, law and news media.

In the mid-1960s, questions about potential biases in mental tests and their use became popular topics among psychologists. Two initial issues of focus among psychometricians were whether mental tests are valid predictors of performance *only* for the majority population (a phenomenon termed "single-group validity") and whether they predict the performance of minority persons *less well than* they predict performance for members of the majority (a phenomenon known in the literature as "differential validity"). Many investigators have concluded that the extensive body of research produced in the 1960s and 1970s decisively rejected the single-group and differential validity hypotheses (see for instance, Jensen, 1980; Flaugher, 1978; Boehm, 1972; Cleary, Humphreys, Kendrick, & Wesman, 1975; Stanley, 1971).

While this does not imply that all questions regarding bias in testing were answered (or have yet been answered), the notion that mental tests are so problematic that they should be abolished or their use curtailed is a view that receives little support from testing specialists. Snyderman & Rothman (1988) sampled over a thousand testing experts in 1984. These individuals, 65% of whom responded, consisted of a group of professionals within various research and educational fields who had some degree of expertise related to mental tests. Respondents were first asked to provide their estimate of the extent to which intelligence tests are biased against Blacks and members of lower socioeconomic groups. On a four point scale, where 1 was coded "Not at all or insignificantly biased," 2 was "Somewhat biased," 3 was "Moderately biased," and 4 was "Extremely biased," the mean ratings for each of these questions varied between

2.10 and 2.25, and the standard deviation for each was approximately .8. Thus the experts believed at that time that tests (or their common usages) were characterized by some significant amount of bias, but an amount which was too small to be characterized even as moderate. 73% and 74% favored the continued use of intelligence and aptitude tests in promotions and hiring decisions, respectively. The sample was also asked whether specific college admissions tests, including the SAT, ACT, LSAT, GMAT, MCAT and GRE, should continue to be used. The use of each of these tests was favored by at least 82% of respondents, and the SAT's continued use was favored by the highest percentage of all—89.6%.

What Is Bias?

Concerns over the fairness and validity of mental tests were raised as early as Binet's development of an intelligence test in France in 1905. It was noticed almost immediately that children of lower class parents on average scored lower than children from the middle and upper classes. By some contemporaneous observers, this was interpreted as evidence of a bias in the instrument (Jensen, 1980). A decade later, during World War I, Terman and his associates engaged in the first mass-scale intellectual assessments, using American military personnel as subjects. The researchers soon recognized that the test they were employing, known as the Army Alpha, was too language-laden to adequately assess and classify many recruits, particularly recent immigrants whose English skills were poor. This determination resulted in the development of a culture-reduced exam, the Army Beta, which was then administered to the appropriate populations. As the Binet and Terman examples show, test bias was conceived of early in the history of mental measurement. Practitioners recognized, almost from the very beginning of testing, that a particular instrument might be inappropriate to use with some examinees because of differences in the extraneous attributes among groups.

Though psychologists have always been the leading developers and proponents of the use of mental tests for employee and student selection, most research and commentary on the issue of test bias prior to the 1960s was published outside of psychology (Jensen, 1980; Cronbach, 1975). Walter Lippmann, the celebrated American journalist, first brought the testing controversy to national attention in 1922 and 1923 in a series of articles published in *The New Republic*, where he attacked intelligence tests for alleged class bias. In the late 1940s and early 1950s, when testing in the United States was near its popular crest, sociologists including Allison Davis (Davis, 1949) and Kenneth Eells (Eells, Davis, Havighurst, Herrick, & Tyler, 1951) further argued, albeit with little notice, that mental tests systematically underestimate the abilities of working class children.

It was not until after the civil rights movement that concerns regarding racial discrimination led psychologists themselves to tackle the issue of test bias.

One foundational task was to produce a conceptually rigorous and generally accepted definition of bias. As Linn has described, bias is a "multifaceted concept with many meanings for both measurement specialists and nonspecialists" (Linn, 1990 p. 309). Influential definitions of test bias have sometimes been generated under highly questionable circumstances, such as in litigation. The judge in one famous case, *Larry P. vs. Riles*, even held that test bias is indicated wherever tests expose mean differences between groups (Stone, 1992), a conclusion that has been summarily dismissed by psychometricians (Jensen, 1980) since it implies that no real differences between groups *can* exist.

Through the 1960s and 1970s, testing specialists advanced a variety of bias definitions (e.g. Linn, 1973; Thorndike, 1971; Cole, 1973, Darlington, 1971). In each principal case, the investigators based their arguments with reference to the standard least squares regression model. To examine whether a test is biased is in essence to ask if it systematically predicts less accurately for or less precisely for individuals belonging to one group as opposed to another. If it does, use in employment or education can lead to unfair discrimination, seminally defined by Guion as occurring "when persons of equal probabilities of success on the job have unequal probabilities of being hired for the job" (Guion, 1966, p. 26).

Cleary, who published one of the first studies to raise the issue of test bias in the college admissions context, offered that "A test is biased for members of a subgroup of the population if, in the prediction of a criterion for which the test was designed, consistent nonzero errors of prediction are made for members of the subgroup" (Cleary, 1968, p. 115). This conceptualization, now often referred to as the Cleary model of test bias, became for a time the most commonly referenced definition of test bias in the literature and in government standards, (e.g. Equal Employment Opportunity Commission, 1978). Nevertheless, from a psychometric standpoint, it is incomplete. Jensen's (1980) definition of test bias subsumes the Cleary definition and many of the others promoted in the 1970s. Assuming a perfectly reliable *criterion*, Jensen wrote:

> "A test with perfect reliability is a biased predictor if there is a statistically significant difference between the major and minor groups in the slopes b_{YX}, or in the intercepts k, or in the standard error of estimates SE_Y of the regression lines of the two groups. Conversely, an unbiased test with perfect reliability is one for which the major and minor groups do not differ significantly in b_{YX}, k, or SE_Y "(Jensen, 1980, p. 379).

After the National Research Council's report on ability testing was published (Wigdor & Garner, 1982), the American Psychological Association, along with the American Educational Research Association and the National Council on Measurement on Education, issued a joint statement that endorsed Jensen's definition: "The accepted technical definition of predictive bias implies that no bias exists if the predictive relationship of two groups being compared can be adequately described by a common regression algorithm (e.g., regression line)…Differing regression slopes or intercepts are taken to indicate that a test is differentially predictive for the groups at hand" (APA, 1985, pp. 12-13).

Taking the Jensen definition as the standard, test bias can be analyzed and divided into three categories based upon the relationships of data between majority and minority groups. These categories are: slope bias, standard error of estimate bias, and intercept bias.

In the case of slope bias, the slopes of the regression lines for groups are unequal. This implies that at some points along the predictor scale, a given score might predict the same outcome for majority and minority groups, while at other points a given score might predict quite different outcomes. For instance, an SAT score of 1250 might predict a GPA of 3.1 for both groups, whereas some other score, e.g., 1000, might predict a GPA of 2.6 for the majority group but only 2.3 for the minority group.

If standard error of estimate bias is found, the *accuracy* of prediction differs for groups, i.e., the spread of scores around the regression line differs. For example, a predictor score of 1250 in the majority group might predict a GPA of 3.1±.4 whereas the same score in the minority group might predict a GPA of 3.1±.9.

With intercept bias, the slopes are the same for groups, but a given predictor score indicates that different criterion scores will be achieved for each group. For example, a predictor score of 1250 might predict a GPA of 3.1 for the majority group, but a GPA of only 2.9 for the minority group.

Whether any of these categories of bias exist for a particular use of a test can be revealed by asking the following questions (negative answers to which indicate the existence of bias). For slope bias: does any given score at any point along the predictor scale predict the same outcome for members of each group, or, if there is a difference in predicted outcome, is it the *same* difference at all points along the predictor scale? For intercept bias: given equal slopes, does a given score predict the same outcome for members of each group? For standard error of estimate bias: given equal slopes and equal intercepts, does a given score predict the same outcome with equal confidence for members of each group?

Even when a test is unbiased with regard to a particular criterion, bias in test *usage* can still exist when a test is used in inappropriate contexts. If the SAT, for instance, were used to screen candidates for a construction job in southern California, it might lead to ethnic bias in selection. The test would likely have little if any validity in relation to performance on the criterion; some ethnic groups average higher scores than others; and non-English-speaking applicants would be unfairly disadvantaged. Likewise, using a standard test of clerical speed to hire applicants for sales positions would likely be unrelated to the job and biased against men, who tend to perform worse than women on tests of clerical speed.

FACTORS THAT HAVE BEEN PROPOSED TO ACCOUNT FOR GROUP DIFFERENCES IN INTERCEPTS

Predictor Unreliability

Reschly & Sabers (1979) noted that when group differences in regression equations are observed, "the differences are most often due to variations in intercepts resulting in slight overpredictions of performance for [non-Asian] minorities from a common regression equation" (Reschly & Sabers, 1979, p. 1). The finding was reported numerous times through the 1970s, the period during which test bias received the most attention in the literature (e.g., Boehm, 1972; Goldman & Hewitt, 1976; Kallingal, 1971; Stanley, 1971; Temp, 1971). It has also been found more recently (e.g., Ramist et al., 1994).

Some researchers have suggested that intercept bias is partially a consequence of imperfect test reliabilities (e.g., Humphries, 1986; Linn, 1983, 1984; Linn & Werts, 1971; Reilly, 1973). For example, Linn & Werts (1971) asserted that Black overprediction is to be expected from imperfect test reliability and Hunter & Schmidt (1976) stated that test unreliability could account for as much as half of the overprediction of Black college grades. However, Stricker, Rock, & Burton (1993) dismiss imperfect test reliability as unimportant in the college GPA prediction context because of the extremely high reliabilities of the SAT. Also, the effect of test unreliability is an explanation only where considerable group differences in performance exist. Average score differences on the SAT are in fact *small* between men and women, and smaller between Whites and Asian-Americans (see Table 1.1), yet significant intercept bias persists between these groups.

Criterion Bias and Group Differences on Uninvestigated Predictors

Even a reliable and unbiased test might not yield similar intercepts, standard errors of estimates or slopes for all groups if the *criterion* being predicted were biased. As an example, consider a highly reliable employee selection instrument developed and validated on samples of Black and White workers at a particular plant location where there was no racial bias in work evaluations. If managerial evaluations of employee performance in other locations were racially biased, the use of the test at those locations could not yield equally valid predictions of success.

In the context of SAT prediction, criterion bias refers to GPA unreliability, often a consequence of differential grading standards across curricula. The stringency of grading standards is in fact known to vary from discipline to discipline (e.g., Clark & Grandy, 1984; Hewitt & Goldman, 1975; Elliott & Strenta, 1988; Young, 1991; Stricker et al., 1993). Among students majoring in electrical engineering, for example, a GPA of 4.0 might represent a much higher level of attainment than a GPA of 4.0 received by a student majoring in education. This implies something critically important to the discussion of intercept bias and

Table 1.1

Average Score on the SAT by Racial/Ethnic Group, 1998			
Gender/Ethnic Group	**Verbal SAT**	**Mathematical SAT**	**Total SAT**
Males	509	531	1040
Females	502	496	998
Asian	***498***	***562***	***1060***
Black	*434*	*426*	*860*
Mexican-American	*453*	*460*	*913*
White	***526***	***528***	***1054***

Source: *Chronicle of Higher Education*, August 27, 1999 Volume XLVI, Number 1.

the SAT: namely, that criterion bias might account for a major part of the observed intercept differences between groups. Groups might differentially self-select majors in the different colleges within a university (where colleges might have different grading standards), or groups might select different majors or courses within these colleges (where courses within a college might have different grading standards), or groups might take the same classes and face instructors who engage in biased grading.

If standards differ from field to field, and if women major in fields with lower grading standards as compared to men with the same SAT scores, then women will *appear* to overachieve (i.e., be underpredicted). Hewitt & Goldman (1975), concerned with the underprediction of women's grades, studied 13,000 undergraduates from four schools in the University of California system and found "Differences in regression intercepts, which imply overachievement, were eliminated or drastically reduced when major field choice was controlled" (Hewitt & Goldman, 1975, p. 325). This finding has been replicated more recently in some samples (e.g., Patton, 1998) but not others (Stricker et al., 1993, discussed below).

Instructors adapt their grading standards to the level of talent they encounter in the classroom (e.g. Goldman & Hewitt, 1975a; Goldman, Schmidt, Hewitt, & Fisher, 1974). Goldman & Richards (1974) report a study using data from the University of California at Riverside, at which it was found that the grading standards in various fields are related to the academic caliber of students in those fields. These authors developed a matrix that allowed the conversion of a GPA from one field into the predicted GPA from another, based on SAT scores. Elliott & Strenta (1988) investigated the magnitude and effects of different grading standards in various departments at Dartmouth College and found that the rank order difficulty of Dartmouth departments, as determined by an index of grading standards that corrected for differences across departments, was correlated highly with the rank orderings from UC Riverside and elsewhere.

While different grading standards across departments have been found to account for some of the intercept differences observed in college grades (see most notably Ramist et al. 1994, as discussed below), intercept differences persist, particularly within such fields as mathematics, engineering, and science. But the studies of criterion bias are not unanimous in their conclusions. Using first semester freshman GPA, Stricker et al., (1993) found that making adjustments for different grading standards had *no* effect on diminishing group intercept differences in a sample from one large state university. However, variables relating to studiousness, academic preparation, and attitudes toward math—"characteristics on which women and men differed and that were associated with components of academic performance not predictable from SAT scores" (Stricker et al., 1993, p. 717) did reduce the amount of intercept bias by a significant amount (effect size of the intercept bias was reduced from d = .243 to d = .088).

The most effective variables were years of various academic high school courses taken and average grades obtained in the high school courses taken. It had earlier been suggested by other researchers (Linn & Werts, 1971) that gender intercept differences could partially be a consequence of other non-cognitive variables, such as personality traits (Farr, O'Leary, & Bartlett, 1971).

ADDITIONAL PRIOR FINDINGS ON INTERCEPT BIAS

Intercept bias has been subject to extensive analysis in the collegiate setting. With reference to a common regression line, the SAT commonly underpredicts the GPAs of Asian-Americans and women and overpredicts the GPAs of Blacks and Hispanics (see, among others, Donlon, 1984; Clark & Grandy, 1984; Sue & Abe, 1988, Sawyer, 1986, Ramist, 1984, Pennock-Roman, 1990; Ramist et al., 1994; Linn & Dunbar, 1982; Breland, 1979). Intercept differences are also often found in the gender context. Linn (1982) reviewed gender differences in intercepts and reported that among students at 10 colleges studied, "For women with average SAT scores, the predicted GPA based on the equation for men was between a quarter (.24) and a full (.98) standard deviation below the actual mean for women. In terms of a 4-point scale, the equation for men typically underpredicted the women's GPA by .36" (Linn, 1982, p. 375).

Bridgeman & Wendler (1991) obtained first-year mathematics course grades from nine universities and found that although grades in the courses were approximately the same for men and women, women's scores on the math portion of the SAT were about a standard deviation lower than the men's. This finding is important because it contradicts the theory that intercept differences are merely a consequence of differential course selection, since men and women's grades within the same courses were compared in this study. The authors write,

> "The results of our study are inconsistent with theories that explain the relatively high grades of women in terms of teachers assigning higher grades because of such student social variables as neatness, attending class regularly, and doing homework assignments on time {since} they typically do not influence grades in large college mathematics courses…However, behaviors such as regular attendance, or regularly doing homework could help to explain the current results to the extent that these behaviors would make a student better prepared to take classroom tests" (Bridgeman & Wendler, 1991, p. 283).

In a similar study, Wainer & Steinberg (1992) found that with men and women earning the same grade in the same mathematics courses, women received SAT-M scores 33 points lower than the men.

In a reanalysis of the Wainer and Steinberg data, Bridgeman & Lewis (1996) point out that when high school GPA is included in the prediction equation along with SAT-M, gender intercept differences for the math grades are reduced by more than half in this sample. A number of technical reports published by the Educational Testing Service and American College Testing Program also demonstrate that predicting college GPA with a combination of HSGPA and either ACT or SAT results in a smaller male/female intercept bias (e.g., Donlon, 1984; ACT, 1973). In a study at San Diego State University, it was found that no gender intercept bias in course grades remained once HSGPA was added to the SAT prediction equation (McCornack & McLeod, 1988).

In the ethnic context, intercept bias in the SAT's prediction of grades was at first focused exclusively on Blacks (Cleary, 1968). Temp (1971) compared the regressions for Black and White freshmen at 13 integrated colleges and found them to be significantly different in 10. Across all 13, Black GPA was overpredicted by an average of 0.37 standard deviations. Davis & Kerner-Hoeg, (1971) also found Black overprediction in their study of six colleges in North Carolina.

Goldman & Hewitt (1975b) noted that by the time of their writing, group intercept differences in college grades had already been investigated by several researchers using Black/White samples, and expressed concern over generalizing results from those comparisons to other groups, suggesting that differences such as bilingualism, cultural values and child-rearing practices might influence performance of other minorities in ways not captured by the earlier research. In a study involving undergraduates from several campuses of a state university system, they regressed college GPA on HSGPA, SAT-V, and SAT-M. The authors found no clear evidence for systematic group differences in intercepts between Whites and Mexican-Americans, although an earlier study (Goldman & Richards, 1974) reported that Mexican-American GPA was overpredicted by .14 standard deviations at UC Riverside. At least one other early study failed to find evidence of intercept bias—Cleary's 1968 investigation of three integrated colleges found that in two of the schools there were no significant differences in the regression lines of Whites and Blacks.

Law schools and medical schools typically assign an identical curriculum for first-year students, a condition that eliminates the chance of GPA unreliability due to differential course selection. Pitcher (1974, 1975) reported no significant tendency for a common regression equation of FYGPA on LSAT to underpredict for women. Law students are a more homogeneous group than undergraduates, so whether the apparent absence of gender differences in intercepts is due to more standard grading or to less variation in student factors is unknown. However, citing technical reports that used the LSAT as a predictor, Linn (1982) relates that 41 of 42 comparisons involved significant differences in Black/White regressions, with the most common difference being intercepts. Further, in 13 law schools intercept differences between Whites and Hispanics were observed, all involving in the overprediction of Hispanic performance. Studies have also analyzed bias and validity in medical school grades (Koenig, Sireci, & Wiley, 1998; Vancouver, 1990). Koenig et al. (1998) examined the grades of over 12,000 first year medical students and found that the MCAT overpredicted performance for Hispanics and slightly underpredicted for Whites.

Other findings further support the contention that intercept bias is not merely the consequence of criterion bias peculiar to class grades. Breland &

Griswold (1982) examined various tests, including the SAT, and found that using the criterion measure of essay performance, the typical patterns of intercept differences (overprediction of Blacks and underprediction of women) prevailed. In another investigation, Stone (1992) sought to determine whether a test battery measuring cognitive ability and academic achievement predicts achievement similarly for Asian-Americans and Whites. GCA (a cognitive ability test) was used to predict achievement on word reading and basic number skills. Subjects were from the GCA standardization sample. When GCA was used to predict word reading scores and basic number skills, Asian-Americans were underpredicted. In two other studies, Stone & Gridley (1990, 1991) found intercept bias where non-verbal ability was used to predict achievement test scores for Native American and White children—Native Americans were overpredicted by the measure of non-verbal ability. In another early study, Kallingal (1971) regressed sophomore year GPA on a battery of five achievement and ability test scores for 225 full-time Black and 511 White students and found that the battery overpredicted the GPA of Blacks.

Intercept bias is not limited to situations involving educational prediction. According to Linn (1982), regression differences are less frequently found in employment settings, but when they are, the tendency there too is toward overprediction of non-Asian minorities. The general pattern has also been reported for Air Force training programs (Valentine, 1977). In regard to Valentine's research, Linn states,

> "For a person with average scores on the predictors, which included the AFQT, the Armed Services Vocational Aptitude Battery, and an index of educational background, the predicted final grade in the technical training school was found to be higher in all twenty-four job areas using the equation for whites than it would be using one for blacks" (Linn, 1982, p. 383).

The most comprehensive investigation relevant to determining the effect size of both gender and ethnic intercept bias in the SAT's prediction of college grades is reported by Ramist et al., (1994). Their investigation is based on data from over 46,000 freshmen at 45 colleges. The study found the typical patterns of intercept bias described earlier in this chapter: with reference to a common regression line, Asian-American and female underprediction, and Black and Hispanic overprediction. Their analysis found that the full-scale GPAs (FGPAs) of Asian-Americans were underpredicted .08 (on a four-point scale) using the SAT as a predictor, and by .04 using a combination of HSGPA and SAT. They found little evidence for significant underprediction of Asian-American FGPA using high school GPA (HSGPA) as the sole predictor.

Ramist et al. also analyzed intercept bias within types of courses. Their analysis divided courses into 37 categories (e.g., calculus, pre-calculus, advanced English, regular English, remedial English, etc.) and compared the obtained course grades with the grades expected based on SAT and HSGPA. The analysis showed that the underprediction of Asian-Americans' grades was not uniform across the curriculum: it was highest in science, math, and engineering courses. When course grades were predicted by SAT and HSGPA, the total underprediction was .08 on the four-point scale. In precalculus courses however, Asian-Americans were underpredicted by .24 points. In remedial math, the underprediction was .20; in calculus, .18. In nonlab physical science and engineering courses, underprediction of Asian-American course grades was .15, and in lab physical sciences and engineering courses, it was .14.

CONSEQUENCES OF INTERCEPT BIAS

The mass of research has indicated that Black and Hispanic overprediction and female and Asian-American underprediction are real phenomena, though as the Ramist et al. data show, they are phenomena of relatively small effect size. Nevertheless, intercept bias can have important consequences for individuals and groups when selection decisions are made. In an influential critique of the gender intercept bias in the SAT, Rosser (1989) claimed that by underpredicting women's college grades, the SAT adversely impacts women in three significant ways. First, low test scores likely cause some women to lower their expectations when applying to selective colleges, even though such women's chances of academic success at selective colleges would be *higher than* men with the same SAT scores. Second, she argues that the use of the SAT as a selection device for accelerated programs and courses in secondary education unfairly penalizes girls.

Third, reliance on the SAT unfairly diminishes girls' chances of receiving scholarships. These same arguments also apply to Asian-American students whose performance is underpredicted by tests such as the SAT.

Overprediction results in *more* Blacks and Hispanics being selected for college admission and employment. Because the under-representation of Blacks and Hispanics has been matter which public policy has sought to remedy, relatively little commentary followed once it was established that SAT intercept bias does not obviously work detrimentally toward Blacks and Hispanics. Nevertheless, college admission and employment offers given to overpredicted minority members might be a cause of higher levels of school and job failure. This possibility has not received much attention.

While standardized tests have been criticized for their imperfections, other methods of selection such as letters of recommendation and essays, add little to the prediction of college academic achievement (Klitgaard, 1985) and there is no reason to believe the use of such measures would be free of biases against various groups. The most appropriate method of examining the effectiveness and fairness of a given predictor is not by comparison to a perfect standard, but by comparison to available alternative standards. As Linn (1990) discussed, HSGPA is the only typically-used predictor of college freshman GPA that is more valid than the SAT, though the validities of both are reduced by various factors. And as a predictor of college freshman GPA, HSGPA itself also slightly underpredicts females and more significantly overpredicts Blacks and Hispanics (by more than 1/3 of a standard deviation of GPA), according to Ramist et al., (1994).

Overprediction, whether by the SAT or HSGPA, might signal the existence of obstacles preventing Blacks and Hispanics (and even Whites, who are also underpredicted vis-à-vis Asian-Americans) from reaching their academic potential in college. In the largest study to date, Black and Hispanic students in some science, math, and engineering courses receive grades an average of nearly four-tenths of a standard deviation lower than Asian-Americans with similar SATs and HSGPAs (Ramist et al., 1994). Finding the causes of this overprediction, especially for coursework in professional fields where non-Asian minorities are highly under-represented, might be an important key in improving the performance of these groups.

Chapter II: Education-Related Differences Among Asian-Americans and Other Groups

INTRODUCTION

During the 1970s and 1980s, the scientific literature and popular press often reported that Asian and Asian-American mean IQs are higher than the mean IQ of Whites. Flynn (1991) argued however that many of the studies upon which these reports were based made a consistent error that inflated the estimates of Asian and Asian-American IQ. The inflated estimates occurred, Flynn said, because these studies used outdated test norms that failed to compensate for a secular trend of increasing IQ scores. Since IQ tests are normed to provide a mean score of 100 for the general population, a test developed in 1960, for instance, and subsequently used to test a subject in 1980, would give an inflated score unless the secular trend were taken into account. The increase due to the trend amounts to approximately 3 points per decade, summing to an entire standard deviation over the course of 50 years. The cause of the phenomenon, termed the "Flynn effect," is not known—it may be an artifact produced by improved education and test-taking skills, or in part a genuine increase in average intelligence, perhaps generated by such factors as improved nutrition and health care.

Flynn's reassessment of the IQ data led him to conclude that the real Asian IQ advantage is either much smaller or nonexistent. He noted that all of the major surveys of Asian-American IQ through the mid-1980s indicated that their mean IQs are comparable to, or even a point or two below, the White American mean. The verdict is not yet in, however. According to Stone (1992), Lynn, Pagliari, & Chan (1988) found that an Asian sample in Hong Kong performed approximately 2/3 of a standard deviation above Whites on Raven's Progressive Matrices, a highly g-loaded test of abstract reasoning. In another study, Asian-Americans scored approximately 1/3 of a standard deviation higher than Whites on the General Conceptual Ability (GCA) components of the Differential Ability Scales (DAS), and higher on each of the nonverbal subtests and clusters of the DAS (Stone, 1992).

Regardless of whether Asian-Americans do enjoy a true IQ advantage over American Whites, the readiness to accept the idea has likely been a consequence of the high levels of Asian-American academic and economic success (e.g., Steinberg, Dornbusch & Brown, 1992; Caplan, Choy, & Whitmore, 1992; Matute-Bianchi, 1986; Tsang, 1988; Wong, 1980; Sue & Okazaki, 1990). Yet if Asian-Americans do *not* have higher than average IQs, this leaves another anomaly to be explained: the existence of remarkable Asian-American academic and economic achievement *in the absence of* higher than average IQs. Flynn's analysis indicates that Chinese-Americans, for example, attain educational and economic success in the U.S. comparable to Whites with an IQ of approximately 115.

Even if the Chinese-American population does possess an IQ advantage, no evidence suggests that it is as large as a full standard deviation, so one implication of Flynn's reassessment of the IQ data is that Asian-Americans overachieve relative to Whites. Just as the SAT underpredicts Asian-American freshmen college grades, IQ tests underpredict Asian-American achievement.

What accounts for the high levels of Asian-American success? Flynn suggests two complementary explanations—logical deductions—given the proposed similarity of Asian-American and White IQs and the observed high levels of Asian-American attainment. The first is that a greater percentage of Asian-Americans *at or above any given IQ level* achieve more academically and find higher-status occupations than Whites with comparable IQs. In other words, Asian-Americans as a group capitalize on their intellectual abilities more successfully: if N% of Whites with IQs above X rise to professional status, then N+M% of Asian-Americans do so, according to Flynn's "capitalization hypothesis." Second, Flynn suggests that Asian-Americans may have lower "IQ thresholds" for achieving high grades, earning degrees, and finding high-status occupations. For example, if virtually 100% of the White Americans who obtain degrees in law or medicine have IQs at or above X, then some percentage of Asian-Americans who have IQs *below* X attain the same levels of success, according to Flynn's "threshold hypothesis."

One approach to finding out why Asian-Americans excel is to examine variables which have both a known relationship to academic achievement and which differ in degree between Asian-Americans and other groups. Prior research has suggested many variables that might account for much of the underprediction of Asian-American college grades by the SAT and general underprediction of economic and educational success by IQ tests. As a point of departure, Duran (1983) provided a list of possible factors to explain Hispanics' school achievement that might also explain Asians' achievement in school and beyond. The personal factors Duran identifies include educational aspirations, vocational aspirations, academic self-concept, academic self-confidence, study habits, social adjustment to college, emotional adjustment to college, proficiency in English, academic preparation for college work, students' financial and personal needs related to family obligations, factors arising from migration experiences, and acculturation. We might add to Duran's list such variables as peer support for academics, time management skills, self-efficacy, parental support, family size, educational level of parents, socioeconomic status, generational status, and years living in the U.S. Some of these variables could be subdivided (e.g. study habits into note-taking, class attendance, amount of time studying, methods of studying, etc.).

The research on some of these types of variables reveal differences between Asian-Americans and other groups, and thereby provides plausible explanations for the underprediction of Asian-American college grades by tests such as the SAT. In particular, studies have shown that Asian-Americans differ in regard to parental expectations of academic achievement as measured by grades, parental aspirations for educational attainment (i.e., amount of schooling), fear of failure, classroom engagement, attributions regarding success and failure (i.e., view of ability), peer support for academics, and secondary school curriculum. It is the central hypothesis of this study that these variables do account for the observed intercept bias in the SAT's prediction of the college grades of Asian-Americans and other groups.

SOCIAL AND SOCIAL COGNITIVE DIFFERENCES

"In terms of school achievement . . . it is more advantageous to be Asian than to be wealthy, to have nondivorced parents, or to have a mother who is able to stay at home full-time." (Steinberg, 1996, p. 86).

Sociological Views

The earliest literature focusing on Asian-Americans' extraordinary academic success began appearing in the 1960s (Slaughter-Defoe, Nakagawa, Takanishi, & Johnson, 1990). After a lull in the 1970s, the early 1980s saw a revival of interest in the issue. Whereas the earlier investigations focused on Chinese- and Japanese-Americans, the newer studies investigated more recently arrived immigrants, such as the Koreans, Vietnamese, and Cambodians. Much of this later literature interprets Asian-Americans as a "model minority" in terms of educational and economic achievement in the U.S.

A common sociological hypothesis regarding academic attainment is that it is a function of social class. While an often-found relationship exists between education and class (e.g., Jencks, Crouse, & Mueser, 1983), it is inadequate to explain Asian-American academic achievement (Schneider, Hieshima, & Lee, 1994). A quantitative approach to the SES issue was taken by Fejgin (1995), who examined family income and parental education level among a large number of ethnically diverse students from the National Educational Longitudinal Study of 1988 (NELS:88) database, (a database containing information gathered directly from parents, teachers, and schools around the country). Fejgin's analysis showed that in a multiple regression with various measures of parental and student attitudes and behavior, SES (as measured by family income) did not explain a significant amount of variance on standardized scores on reading and math achievement tests. Fejgin concluded that,

> "racial-ethnic differentials in school performance should not be reduced to class differences. Different ethnic groups, even within the White category, that we researchers tend to view as unitary, have distinct values and attitudes related to schoolwork and use different socialization patterns to encourage or discourage academic performance." (Fejgin, 1995, p. 28).

Kao's (1995) analysis of the NELS:88 data showed that once the effects of SES and sex were controlled for, Asians still earned higher math test scores, although reading scores were comparable to Whites.

Striking anecdotal evidence of the inadequacy of SES to explain Asian-American educational achievement is provided by Caplan et al. (1992), who studied a sample of 200 Southeast Asian refugee families and their 536 children. The families had been living in the U.S. an average of three and a half years and knew almost no English at the time of their arrival here; many arrived with virtually no material possessions after spending years in relocation camps overseas. All of the children in the study attended schools in low income metropolitan areas. Despite these disadvantages, the children, divided about evenly among grades K-12, achieved an overall B average on their grade reports. Math grades were even higher, with almost half of the students earning As. Moreover, on a battery of nationally standardized achievement tests, these students scored in the 54th percentile.

While, as Fejgin suggests, different ethnic groups within the Asian and White categories possess many distinct values, attitudes, and socialization patterns, the demographic research comparing Asian-Americans and Whites as aggregate categories reveals some interesting findings. Peng & Wright (1993) examined Asian-American demographic and academic data from the NELS:88 database and found that a higher proportion of Asian-American students' parents had earned advanced college degrees than White students' parents (22% versus 14%) and that Asian-American children are more likely to live in two-parent families than Whites.

Although the average incomes of White and Asian families in the NELS:88 database are essentially the same, a greater proportion of Asian parents report that they had begun saving money for their children's college education (Kao, 1995). And among parents who were saving, the Asian parents had already saved more than White parents, and stated their intentions to save more by the time of their children's high school graduation than White parents planned to save by that time. Kao emphasizes that the financial resources of the Whites and Asians in the study were similar and concluded that the higher Asian savings rate indicated "a greater commitment of resources for education among Asian parents than among white parents" (Kao, 1995, p. 135).

The academic success of recent Asian-American immigrants is somewhat counterintuitive given the fact that many such families have limited capacity for English when they arrive. Surprisingly though, Kennedy & Park (1994) found that the data from NELS:88 indicate that speaking a language other than English in the home was positively associated with the mathematics, English and science grades of Asian-American students (though it was negatively related to their test scores in reading). In fact, for mathematics grades, speaking a language *other than English* in the home was one of the two strongest predictors of grades. This inverse relation between grades and English spoken at home might be a result of the cultural advantages that fade with acculturation to American social norms as English skills are developed. Stevenson, Lee, & Steigler (1986) point out that many Asian-American immigrants arrive from countries where students have longer school days and attend school more days each year. This might offer recently-arrived Asian-Americans an advantage when they face the less rigorous academic culture in the United States since they are adapted to more rigorous educational practices in their home countries.

Another hypothesis is suggested by Lin and Fu (1990), who cite Lum and Char's 1985 study of Chinese immigrants to Hawaii as showing how "Chinese parents place great importance on academic achievement as a means to acquire personal advancement, higher social status, wealth and respect in the Chinese society, and as a means of overcoming discrimination and gaining opportunities in the United States" (Lin & Fu, 1990, p. 430). Sue & Okazaki (1990) and Nagasawa & Espinosa (1992) likewise argue that Asian-Americans invest more heavily in education as a way to achieve economic success in the face of subtle racism which they might be more likely to encounter in fields where formal education is less needed. And in the educational system, Asian-Americans tend to avoid "softer" fields such as the humanities and social sciences, where evaluation of performance is regarded as more subjective (Kim & Chun, 1994). Since their mobility is arguably more likely to be impaired in non-educationally dependent fields, “education assumes importance, above and beyond what can be predicted from cultural values” (Sue and Okazaki, 1990, p. 913).

Consistent with this hypothesis, Ritter and Dornbusch (1989) found that Asian-Americans were much more likely than other racial groups to endorse the idea that success in life depends on what is learned in school, and data from Chen & Stevenson (1995) showed that Asian-Americans have higher perceptions of the importance of going to college and getting good grades. Leong (1991) studied Asian-American college students and found that their responses to questions from an occupational values scale indicated that they place more emphasis on income, status, and prestige than Whites, while Leung (1994) found that Asian-American students are more likely than Whites to actively consider pursuing careers in high-status fields. “Such a drive toward high-prestige occupations is perhaps a means to survive and to move upward in the social structure. The need to attain high-prestige occupations can be a result of parental and familial expectations” (Leung, 1994, p. 408).

Background Differences in Parenting Style

Among the theories adduced to explain Asian-American educational success, another sociological vein in the literature has concentrated on the values of Asian cultures, in particular such values as a strong work ethic and a high regard for intellectual achievement (e.g., Kitano, 1984; Sue & Okazaki, 1990; Vernon, 1982). Socialization within the family has been suggested by some to be the primary locus of transmission of these values from generation to generation (Schneider, Hieshima, Lee, & Plank, 1992; Schneider & Lee, 1990; Mordkowitz & Ginsburg, 1987).

Schneider et al. (1992) interviewed Japanese-Americans and found strong emphasis on hard work and achievement, themes which they say suggest that the success of Japanese-American students is rooted in a home environment that stresses academics. They report that while Japanese-American parents do not place direct demands on their children to attain high grades, nor closely supervise homework, their expectations are transmitted indirectly through more subtle expressions of expectation which children are led to internalize. This internalization is captured by a remark made by a Japanese mother, who told the researchers, “I don’t have to say anything about bad grades. My kids have high expectations of their own. If they don’t do well, they’re mad at themselves” (Schneider et al., 1992, p. 344). Similarly, Mordkowitz & Ginsberg (1987) interviewed Asian and Asian-American Harvard students, who consistently expressed the sense that their parents regarded academics as the central duty of their children. Their parents placed high expectations for achievement upon them and organizing their out-of-school time in such ways as to facilitate the emphasis on academics. Unfortunately, because of the unrepresentativeness of the sample and the failure of the study to include non-Asian Harvard students, it is difficult to generalize the conclusions and make comparisons to non-Asian populations.

Child-rearing practices among Asians and Asian-Americans have been the subject of a number of studies in the education literature. For example, Kelley & Tseng (1992) investigated parenting techniques and goals among 38 immigrant Chinese and 38 White American mothers of 3- to 8-year-olds. While they found that these groups of parents had similar child-rearing goals, the Chinese mothers were more likely to engage in harsh scolding, were more restrictive with their children, reported less nurturance, less responsiveness, and less consistency than White American mothers. Likewise, Lin & Fu (1990) studied the parents of 138 elementary school students in Taiwan and the U.S., finding that Chinese and Chinese-American parents rated higher on social control than White parents. Asian-Americans in general have garnered a reputation in the education literature as being authoritarian parents, or at the least, high on social control and low on warmth (e.g., Chiu, 1987; Chao, 1994; Steinberg et al., 1992).

Paradoxically, Baumrind suggested in a series of influential works (e.g., Baumrind, 1971) that children raised by authoritarian parents (as opposed to authoritative parents) are less likely to be academically successful. This view has received support in studies involving White American children (Steinberg, 1996). Steinberg (1990) concluded that three aspects of parental authoritativeness in particular—warmth, behavioral supervision, and the granting of psychological autonomy—enhance academic competence. This seems incongruent with the research describing Asian-Americans as controlling and low on warmth. Yet in one widely cited study on the topic, Steinberg, Dornbusch, & Brown (1992) surveyed 15,000 students at nine ethnically diverse high schools across the country and found that Asian-American youngsters were *least* likely to come from authoritative homes. Within the Asian-American sample, those who came from authoritative homes did no better or worse academically than those from non-authoritative homes, in contrast to the data from the studies involving White children.

Chao (1994) believes that Baumrind's authoritativeness and authoritarian concepts of parenting are culturally limited and fail to capture the reality of Chinese parenting (and perhaps Asian parenting more broadly). She criticizes the characterization of Chinese parenting as "rejecting or hostile" (Yee, 1983) or "restrictive" and "controlling" in the words of Chiu (1987), maintaining that Chinese parenting is guided by the Confucian ideas of *chiao shun* and *guan*. These ideas, loosely translated respectively as "teaching children the expected behaviors" and "governing," may be mistaken for authoritarianism, argues Chao, who surveyed 50 White American and 50 Chinese-American mothers of pre-school children. She found that, after controlling for authoritarianism, Chinese-American and White mothers differed on 8 of 13 items measuring *chiao shun* and *guan*. These differences were interpreted as challenging the authoritarian characterization of Chinese-American parenting. Since Confucian philosophy exerted influence over much of eastern Asia, *chiao shun* and *guan* might also be involved in the parenting practices of Asian immigrants from other countries.

Asakawa & Csikszentmihalyi (1998) agree with Chao's rejection of the characterization of Asian-American parents as authoritarian. These investigators surveyed a sample of Asian and White children selected from 33 schools. The questions dealt with parental involvement in academic decision-making, parental involvement with academic activities, and the frequency of discussions with parents about academic matters. Like Chao, Asakawa & Csikszentmihalyi found that in certain respects the data did not accord with the authoritarian image of Asian-American parents. Compared with White Americans, Asian-American parents were reported to be less likely to decide what courses their children should take, they were less likely to assign their children household chores, they helped their children with homework less frequently, and they discussed academic matters—grades, school activities, and classroom material—less often than did White parents. Kao (1995) reported finding this same pattern of parental behavior in the NELS:88 national sample of Whites and Asian-Americans.

Nevertheless, it is understandable how one would conclude that the authoritarian label describes Asian-American parenting. When Reglin & Adams (1990) investigated 29 Asian-American and 70 non-Asian-American students at one high school, they discovered that 41% of the Asians said they would have to be at least 18 to get permission to go on an unchaperoned date, as compared to only 1% of the other students. And Yao's (1985) study of 60 White and Asian-American elementary and secondary school students from a Texas school district and also found that the Asian parents retained more control of their children than the White parents. Asian children, influenced by parental pressures, spent more time in individual activities such as music lessons than in group-oriented activities, as well as more time on weekends involved with cognitive learning. In another study, Chao (1996) found that Chinese-American mothers are more likely than Whites to require their children to do additional homework beyond what is required at school. 58% (n = 28) of the Chinese-American mothers believed they spent more time and effort in their children's educations than White mothers do.

Asakawa & Csikszentmihalyi also found that Asian-American parents were more likely than White parents to discuss preparation for college entrance exams with the children and to limit the amount of time their children spent watching television and playing video games. As one report phrased it, "Parents help Asian students succeed by carefully structuring their out-of-school time so it is directed at academic-related skills… East Asian students spend much of their time studying rather than playing with their friends or participating in organized group activities." (Schneider & Lee, 1990, p. 374). Schneider & Lee noted also that as Asian-American students reach adolescence, parental interest and control do not diminish. Among those interviewed, 47% of the Asian-American parents (17 out of 36) versus 7% of the White parents (2 out of 28) indicated that they “strictly controlled” their children’s time; most established a specific time for study.

Like other investigations (Kao, 1995; Mordkowitz & Ginsburg, 1987; Stevenson & Stigler, 1992), the Asakawa & Csikszentmihalyi study indicated that Asian-American parents strictly organize their children’s time and efforts to maximize academic success, but within that framework, Asian-Americans do not micromanage their children’s lives. Some evidence indicates that Asian-American parents are actually less involved than White parents in certain areas. Peng & Wright (1994) found that Asian-American parents reported helping their children with homework somewhat less than the average parent, corroborating a finding of Schneider & Lee (1990). And Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh (1987) found that Asian parents who scored the lowest on measures of parental involvement had children with higher grades. One other study, (Julian, McKenry, & McKelvey, 1994), surveyed parents from various ethnic groups about behaviors such as reading to children and helping with homework. But the sample, which included over 2,600 Whites, contained only 49 Asian-Americans. The results were not significant between Whites and Asian-Americans, but the study had very little power.

Direct parental involvement with children’s school activities has frequently been associated with higher grades in White samples (Mau, 1997). Yet Yao (1985) found that the Asian parents made fewer visits to the schools and had fewer contacts with teachers than White parents. Mau (1997) found that a negative relationship existed between Asian-American involvement in school activities and the performance of Asian-American children. It might be the case that Asian-American parents see no need to be involved with their children's school and school activities provided the children do well academically, or it might merely be the case that some Asian-American parents, particularly immigrants, are less comfortable in a setting with which they are relatively unfamiliar.

Differences in Parental Pressure to Achieve

Among the variables that might be responsible for the high levels of Asian-American academic achievement (and the underprediction of Asian-American college grades by the SAT), perhaps none is more intuitive than parental standards relating to school achievement. Parental emphasis on academic achievement has a direct relationship with children's performance in school (e.g., Hess & Holloway, 1984; Hewison & Tizard, 1980; Peng & Hill, 1995, Scott-Jones, 1984; Rosenthal & Feldman, 1991; Smith, 1991), and the level of parental emphasis on achievement, both as expressed by parents and as perceived by students, differs among ethnic groups (Mau, 1997; Hess & Holloway, 1984). Studies have shown that Asian-American parents value education highly and believe very strongly in the importance of effort in attaining success (e.g., Chao, 1996; Pang, 1991; Campbell & Mandel, 1990; Schneider & Lee, 1990; Trueba, 1988; Mordkowitz & Ginsberg, 1987; Yao, 1985). Parental expectations also have an impact in children's school achievement (e.g., Yao, 1985; Chen & Uttal, 1988; Liu, 1998).

The influence of ethnic differences in the emphasis on academic achievement may begin very early in life. In one revealing study, Chao (1996) interviewed 48 immigrant Chinese and 50 White American mothers of pre-schoolers about the role of parenting in school success. Many of the Chinese mothers (64%) expressed the belief that Chinese children excel in school because Chinese parents have higher expectations of their children than White parents do. One Chinese mother stated,

> "We expect more from the kids. An example [is] when the kids have a project to do at school. We say to them, 'You have lots of time and ability,' and American parents say it's too tough for them, too much. This affects their work. When they do the work, the feelings are different; American kids will think it's too much and Chinese kids [will] not." (Chao, 1996, p. 411).

Chao reports that the responses of the Chinese mothers in her interviews were characterized by the following themes: (a) a great value placed on education, (b) a belief in the need to sacrifice and invest highly in their children's education, (c) a more interventionist attitude toward their children's schooling and learning, and (d) the conviction that they can greatly influence their children's school success. In stark contrast, the most prominent themes in White American mothers' responses were: (a) a dismissive attitude regarding the importance of academics and a corollary emphasis on the importance of building social skills, (b) a less directive approach to learning, and (c) a desire to ensure their children possessed high self-esteem. White American mothers frequently gave responses indicating a strong reluctance to "push" academics on their young children and were interested in promoting the notion that learning is "fun, exciting, and interesting."

Chao reports that in her interviews, White mothers frequently refused or were unable to accept the emphasis of questions relating to academic success. Unlike the Chinese-American mothers, the White mothers did not *wish* to stress school achievement with their children.

> "Only a small handful of European American mothers did believe that schooling and learning involved work and that there was no way around this reality. On the other hand, Chinese mothers were very willing to recognize that learning and schooling definitely involved hard work and were necessary for their children's overall future success, especially in attaining career and social mobility" (Chao, 1996, p. 419).

Eighteen (36%) of the White mothers in the Chao study indicated they believed that emphasizing academic success should not be the goal of education and that it is not good for children. Some White mothers voiced the opinion that self-esteem is the most critical factor in a child's success and seemed to believe that academic pressure worked against self-esteem. Nine (18%) of the White mothers believed that their children's social development should be their top concern as a parent.

Mau (1997) found that Asian-American children perceive greater levels of educational expectation from their parents than White children, a finding that is consistent with Mau (1995), Peng & Hill (1995), and Stevenson & Stigler, (1992).

Mau's examination of the NELS:88 database revealed that recent Asian immigrants to the U.S. and Asian-American students whose families had longer tenure in this country did not differ in their perception of parental expectations of school performance, despite the greater opportunity for assimilation by the latter group. Mau also reported that academic achievement was associated with parental expectation.

Yao (1985) investigated a sample of 30 White and 30 Asian-American students from grades 5 through 11 who scored above the ninetieth percentile on achievement tests. Subjects were from three schools in a middle/upper-middle class suburban neighborhood. From interviews with the parents, Yao learned that all of the Asian-American parents stated they expected their children to attain an A average. In contrast, only two-thirds of White parents expected straight As from their children; the other third were willing to accept Bs as a minimum grade. While all the White parents reported being satisfied with their children's school performance, only half of the Asian parents said so.

In a similar study, Okagaki & Frensch (1998) surveyed a sample of 75 Asian-American and 91 White families with fourth and fifth grade children and found that Asian-American parents had higher expectations for educational attainment and were much less satisfied with grades of B and C than were White parents. Caplan et al. (1992) also found that Asian-American parents were less satisfied with Bs and Cs than parents of other ethnic groups. In a cross-national study, Stevenson et al. (1991) found that Asian mothers indicated higher educational expectations for their children, yet considered their children to be inferior to American children in terms of academic ability. At the same time, White American mothers and, to a lesser extent, Asian-American mothers had lower expectations for their children but over-rated their children's school performance.

Further evidence of higher Asian-American parental standards for academic achievement is provided by Schneider & Lee (1990). Their study compared the academic performance of 46 Asian-American and 49 White elementary school sixth and seventh graders and found that Asian-American parents were more likely than White parents to say that Cs are unacceptable (100% versus 67%). While Asian parents commonly endorsed the idea that students should not get Cs if they study hard, White parents often expressed the idea that since Cs are average grade, there isn't much to complain about.

The interviews conducted by Schneider & Lee (1990) showed how school achievement is related to children's perceptions about what pleases their parents. Their results indicate that White parents will show satisfaction if their children are competent in any of several aspects of their children's lives (music, athletics, social life, academics, et cetera). In contrast, Asian parents demonstrate satisfaction only if their children excel academically. Kao (1995) reports,

"One person in our Asian focus group discussion revealed how his brother's success on the track team was not a source of pride for the parents; in fact, they refused to attend any of his track meets. Only straight A's and getting into an Ivy League school would completely satisfy the parents, and this sentiment was echoed in the other Asian students' own experiences. Another respondent wanted to take an acting class but had to plead with his mother for permission to do so. The fear from his mother came from the respondent's cousin who was attending Yale (which is a source of satisfaction for the parents) but had changed his major to drama (which signals a 'major disaster')" (Kao, 1995, p. 151).

Lin & Fu (1990) also found that for immigrant Chinese mothers, the emphasis placed on achievement was much higher than the emphasis on achievement placed by White mothers. In their sample the parents of 138 elementary school students in Taiwan and the U.S., this difference was greater than 1.2 standard deviations. For fathers, the effect size of the difference was smaller, but still large: approximately .75 standard deviations. Chen & Lan (1998) found that Chinese students are somewhat more willing to accept their parents' academic demands than Chinese-American students.

These high standards seem to impact children's pursuit of academic performance. In Schneider & Lee's study, 18 of the 35 Asian students, contrasted with only 5 of the 23 White students, said they tried to attain high grades *in order to* please their parents.

> "Most East Asian children were aware of their parents' expectations for high grades. Interviews with East Asian children indicated that in most instances their perceptions of their parents' expectations for their grades matched the comments of the parent interviews…East Asian children also associated good grades with their parents' honor, pride, or happiness" (Schneider & Lee, 1990, p. 370).

Peng & Wright (1994) found that parents' educational expectations for their children (defined as years of schooling expected) were correlated approximately .26 for both Asians and Whites with standardized achievement tests. These investigators also found that 92% of South Asian parents expect their children to complete college and 72% expect their children to complete graduate degrees. In another study, Kao (1995) found that Southeast Asian parents have higher expectations of their children's educational attainment than White parents, even though they have lower educational levels than White parents.

The great emphasis on educational achievement that many Asian-American parents communicate to their children have resulted in some concerns expressed over children's emotional well-being (see Huntsinger, Jose, & Larson, 1998). Yet Chen & Stevenson (1995) found from a large-scale survey (over 4,000 White and Asian-American, Taiwanese and Japanese eleventh graders) that Asian-American students were no more likely to report indications of maladjustment (depression, stress, aggressive feelings and somatic symptoms) than White students, although Asian-Americans did report a somewhat elevated (but still moderate) level of anxiety regarding academics. Most recently, Huntsinger et al. (1998) reported that a sample of 36 second-generation Chinese-American first- and second-graders were no more likely to show adjustment problems and were as socially competent as a comparable sample of White children.

Differences in Peer Support

The influence of peers and peer groups in academic achievement has been examined in various studies (e.g., Brittain, 1963, Epstein, 1983; Brown, Steinberg, Mounts, & Philipp, 1990; Treisman, 1992). Steinberg et al. (1992) report that their data agree with earlier studies in showing that although parents are more influential in shaping children's long-term academic plans, peers are more influential in guiding short-term behavior, such as classroom behavior and the amount of time given to homework. In their study, Asian-American students reported higher support among their peers for academic achievement and were more likely to be members of achievement-oriented peer groups, members of which studied together and worked together on difficult assignments. While data are sparse showing clear differences in peer behavior between Asian-American and White students as regards academics, anecdotal evidence and common sense suggest that the higher levels of school engagement found in the Asian-American student community might lead to pressures and peer support that have an independent and positive effect on Asian-American academic performance.

Differences in View of Ability in Relation to Success and Failure

The belief in the efficacy of effort might be influential in the formation of school work habits. As one researcher noted, "When parents believe success in school depends for the most part on effort rather than ability, they are more likely to encourage hard work and participation in activities related to academic achievement" (Mau, 1997, p. 268). If students attribute failure to lack of effort, they can expect to improve their performance by increasing effort and may feel the responsibility for poor performance. Conversely, attributions of failure to a lack of ability relieves individuals of responsibility since one cannot exert greater ability when faced with a difficult task. Students who perceive themselves to have low ability may have little incentive to persevere when faced with difficult work.

Some studies have shown that Asian, Asian-American, and White American students differ in their views of ability in relation to academic success and failure. Compared to Whites, Asians and Asian-Americans have been found to attribute their academic performance more to effort and less to ability (Yao, 1985; Hess, Chih-Mei, & McDevitt, 1987; Mizokawa & Ryckman, 1990; Stevenson, Chen, & Uttal, 1990; Reglin & Adams, 1990; Steinberg et al., 1992; Yan & Gaier, 1994; Chen & Stevenson, 1995). Similar patterns have also been found in the attributions that Asian, Asian-American, and White parents make about their children's school success (Stevenson & Lee, 1990; Chuansheng & Uttal, 1988).

High effort attributions might therefore play a role not only in the superior academic achievement of Asian-Americans, but also in the underprediction of Asian performance by the SAT: given two groups of students with roughly equal academic ability, higher effort attributions by one may lead to the exertion of greater average effort within the group, thus increasing the level of coursework performance relative to the other.

A study by Hess et al. (1987) concluded along with Stevenson & Lee (1990) that attributional differences between ethnic groups were related to differences in mathematical performance. Hess et al. (1987) interviewed mothers and their sixth-grade children in the People's Republic of China (PRC) and in Chinese-Americans and American Whites. The samples were small and not randomly selected, but when explanations for performance were indicated by attributions to ability, effort, training at home, training at school, and luck, the groups showed distinct patterns of attributions, with mothers in the PRC viewing lack of effort as the major cause of poor performance. Chinese-American students also regarded lack of effort as important but attributed performance more to other causes. White American students attributed academic performance more evenly across causes. The most interesting result is the finding that, regarding attributions of relative failure, Chinese were *least* likely to blame lack of ability and *most* likely to blame lack of effort. Chinese-Americans were in between the other two groups, a finding consistent with the effects of assimilation into American culture.

Hess et al. (1987) and McDevitt et al. (1986) further provide an indication of the possible effect of immigrant acculturation on attributional processes. In these studies' comparisons of PRC Chinese, Chinese-American, and White-

American mothers and their sixth-grade children, Chinese mothers attributed failure to a lack of effort most frequently and White-American mothers least frequently; Chinese-American mothers were again in between the other two groups in this regard. The children in these ethnic groups showed the same pattern. Although selective immigration cannot be ruled out as a cause for the more American pattern observed among immigrant Chinese mothers and their children, acculturation is a likely explanation.

Reglin & Adams (1990) cite Mizokawa & Ryckman (1988), whose investigation asked primary and secondary school students to attribute academic achievement to effort, luck, ability, or ease of task. Asian-Americans were more likely to attribute success and failure to effort than the other ethnic groups, who tended to favor ability more.

In contrast to the results from the studies above, Eaton & Dembo (1997) found that Asian-American ninth graders did not attribute success to effort more than non-Asians did. Views of effort and ability were not correlated with Asian performance on the task, though they were correlated with non-Asian performance. But here the criterion was not grades or achievement tests scores, but performance on a novel classroom task used in the study. Another study contradicts the general findings cited above: Bempechat, Nakkula, Wu, & Ginsburg (1996) examined 385 fifth and sixth graders, administered the WRAT Math Level 1 and the Sydney Attribution Scale in class, and found few attributional differences among ethnic groups, though Indochinese students attributed failure to lack of ability more often than Caucasians. Bempechat further found that high achievement was positively correlated with ability attributions, but not correlated with effort attributions. In this sample, the subjects were low-SES. Whang & Hancock (1994) also studied 353 Asian-American and non-Asian students in grades 4-6 at two metropolitan public schools to see if motivational differences contributed to achievement differences in math. They examined ability self-concepts, students' perceptions of parental beliefs, and causal attributions of success and failure, finding no differences in causal attributions for low performance.

Yan and Gaier (1994) studied over 300 graduate and undergraduate students (mean age = 29) at a large public university, and found that American students attributed academic success to ability more than Asian students did, though the effect size of the differences seem to be small.

> "Compared with Asian students, American students attributed academic achievement significantly more often to ability than did Asian subjects. American students also appeared to believe effort was more important for success than lack of effort for failure. By contrast, Asian students attributed effort as equally important for both success and failure" (Yan and Gaier, 1994, p. 146).

In each ethnic group, subjects attributed success to their effort, ability, task, and luck—in that order. Failure was attributed to lack of effort, lack of ability, task difficulty, and bad luck—in that order. American students attributed academic achievement more to ability than did Asians, and indicated that effort was more related to success than lack of effort was to failure. The Asian ethnicities regarded effort as important for success and failure equally, or even somewhat more related to failure than to success.

In summary, the data on Asian/White differences in attributions is unclear, though there is some evidence that Asians and Asian-Americans are more likely to attribute success to effort whereas Whites are more likely to credit ability.

Differences in the Experience of Fear of Failure

Steinberg et al. (1992) showed that students' belief that school failure leads to negative consequences is a stronger predictor of school performance than the belief that school success leads to positive consequences. Among all ethnic groups studied, the more that students believe that failing to acquire a sound education hurts their chances in life, the better they perform in school. While Steinberg et al., (1992) found no ethnic differences in the belief that that getting a good education pays off, he did find that Asian-American students more strongly fear negative consequences of educational failure. They also feel greater parental pressure to perform at school, and are more likely to report that their parents would be angry if they failed to make less than an A-. This accords with Stevenson & Lee's (1990) cross-cultural conclusion that Asian students are less sure than American students that their school performance is meeting parental expectations.

Eaton and Dembo (1997) believe that fear of failure is a consequence of the high standards placed on Asian-American students by their parents (see Siu, 1992) and that this pressure motivates Asian-American students to perform well in school. Eaton & Dembo's subjects were 154 Asian and 372 non-Asian ninth graders in four suburban California high schools. Using a survey adapted from various published instruments, they found that achievement behavior on their novel classroom task was best predicted for Asian-Americans by a scale of items termed "fear of failure," though this scale was least predictive for White student performance on the task.

> "Asian American students simultaneously possess a high need to approach success, because of the cultural value of educational achievement, and a strong need to avoid punishment, because of the fear of academic failure. This emotional orientation translates into Asian American students persisting on achievement tasks…while fearing an inability to achieve to parental standards" (Eaton & Dembo, 1997, p. 437).

Acculturation As a Moderator of Intercept Bias

Kao & Tienda (1995) compared first generation children (i.e., children who were immigrants themselves), second generation, and third generation children. Using the NELS:88 database, they investigate the effect of generational status on grades, achievement test scores and educational aspirations of eighth graders. Their analyses found little difference between the first and second generations (both of which outperformed Whites), yet academic achievement of the third generation and beyond was no better than that of White students.

Generational status predicted achievement independently of family income and parental education.

Nagasawa & Espinosa (1992) mention two relevant citations on the topic of generational status and education: Toupin & Son (1985), who found that one group of native born Asian-American students had similar academic achievement when compared to a group of native born Whites, and Feagin & Fujitaki (1972), whose sample of third-generation Japanese-Americans had approximately the same college dropout rates as Whites. This accords with Kao & Tienda’s (1995), conclusion that recent immigrants might be the highest achievers, and Chen's (1996) report that second-generation students achieve the highest educational attainment and that the third generation is less educated and less supportive of education. Kao & Tienda draw attention to Caplan et al.’s (1992) finding that immigrant households are more likely to enforce rules about homework and grades, inculcating them with an awareness of the primary importance of their academic responsibilities.

Fuligni’s (1997) study of immigrant youth indicated that their educational attitudes and behaviors accounted for approximately 70% of generational differences in school achievement once SES is controlled for. This notable investigation involved 1,100 immigrant adolescents from various backgrounds. The results showed that first and second generation students earned higher math and English grades than students from families who had been in America longer.

Intra-Asian-American Ethnic Differences as a Moderator of Intercept Bias

The main findings of Kao (1995) are that family background variables explain the performance difference between Asians and Whites on the NELS:88 academic criteria, and that differences in performance exist among the various Asian ethnic groups. Kao's examination of the NELS:88 database showed that after controlling for the effects of SES, not only do Asians earn higher grades than White students, but only some of the Asian students—Southeast Asians, Koreans, Chinese, and South Asians—earn higher grades than Whites. Other groups—Filipinos, Japanese, Pacific Islanders, and West Asians—attain grades similar to those of White students. These findings are echoed in Blair & Qian's (1998) NELS 1992 follow-up study. With the inclusion of measures of home resources, student characteristics, family structure, and immigrant mother status,

> "Asians still earn slightly higher grades than their white counterparts with similar characteristics and home resources. However, ethnic effects reveal that the advantage of 'Asians' in this expanded model is perceptibly driven by Southeast Asians, the only groups that still earn higher grades than whites even after these expanded control measures" (Kao, 1995, p. 150).

Kao also found that Koreans, Chinese and Southeast Asians attained higher math scores than White students from the same SES levels. The math and reading scores of Filipinos, Japanese, South Asians, and West Asians were similar to those of Whites with similar SES, but Pacific Islanders scored lower than Whites with similar SES.

While Yan and Gaier (1994) found that the four subgroups of Asian students in their study appeared more similar than different in their causal attributions, Mizokawa & Ryckman (1990) compared attribution patterns in six Asian-American subgroups: Chinese, Filipino, Japanese, Korean, Vietnamese, and other Southeast Asians—and found somewhat different attributional profiles among these groups. Though the information comparing the educational attitudes, behaviors and performance of various Asian-American groups is sparse, Mizokawa & Ryckman (1990) provide a compelling argument for the idea of the importance of differences among these groups:

> "Although the people from a geographically identifiable region of the world may be collectively called *Asian* for convenience, the rubric is no more informative than a *White* or *Caucasian* label for a collective comprising Swedes, Britons, Dutch, and Italians. All members of the collective differ from each other in language, culture, religion, and history, though they may share common origins. To group diverse peoples from Asia under the rubric of *Asian* or *Asian American* may serve to mask many underlying ethnic and acculturational differences." (Mizokawa & Ryckman, 1990, p. 435).

DIFFERENCES IN SCHOOL ENGAGEMENT

"…when involved in work-like activities and activities important to future goals, it seems that Asian American adolescents value hard work and high achievement more strongly. In other words, Asian American adolescents seem to have internalized such cultural values" (Asakawa & Csikszentmihalyi, 1998, p. 159.)

The perception of Asian-Americans as diligent students is not lost on their classmates and teachers. Schneider & Lee (1990) found that Asian-American students' high self-expectations were reinforced not only by their peer groups, but also by teachers, and by White students, who had even higher educational expectations for Asian-Americans than Asian-Americans had for themselves. Reglin & Adams (1990) cite a paper by Tom & Cooper (1984), who performed an experiment in which teachers were shown photographs of Asian and non-Asian students, then given sets of fictitious academic records and asked to match the records with the photographs. The teachers tended to assign higher grades to the Asian students. Steinberg et al. (1992) report that Farkas, Grobe, & Shuan (1990) discovered that teachers grade students partly with regard to the quality of their work habits. "The . . . higher relative performance of Asian-American students may be in large measure due to differences in these groups' [e.g. Asian-Americans'] work habits, which affect performance both directly, through their influence on mastery, and indirectly, through their effects on teachers' judgments" (Steinberg et al., 1992, p. 72). Schneider & Lee's (1990) study included the collection of data from teacher interviews which showed that most teachers had particularly high expectations for Asian-American students. Classifying the students into five achievement groups (1 = highest, 5 = lowest), 15 of 16 teachers responded that Asian students usually belong in one of the top two groups. According to the researchers, the teachers expressed having positive views of Asian students and considered them to typically be organized, industrious, quiet and respectful students.

Huang & Waxman (1995) studied 1,200 White and 1,200 Asian-American middle school students and found that Asian-American students expressed a greater desire to succeed, took greater pride in their schoolwork, and had higher expectations of success in their schoolwork. Asian-American students' responses were generally .2-.25 standard deviations higher on these measures than Whites. "These findings support previous research studies which similarly found that Asian-American students strongly value academic learning and are determined to succeed" (Huang & Waxman, 1995, p. 216).

Further evidence of greater Asian-American school engagement was provided by Asakawa & Csikszentmihalyi (1998), who employed an experience sampling method to record the subjective experiences of 34 Asian-American students whose first language was not English, along with a larger sample of White students, in order to examine the nature of their subjective experiences while engaged in activities that would likely lead to future success. Also investigated were how parental practices related to academic concerns differed between Asian-Americans and Whites. Subjects wore preprogrammed signaling wristwatches which sounded at random intervals during the day for a seven day period. Results indicated that the Asian-American students were happier, enjoyed themselves more, and felt better about themselves than White students when their time was spent doing work-like activities. They also reported more positive experiences than Whites when they were engaged in tasks important to achieving future goals—they were happier, enjoyed what they were doing more, and felt better about themselves than Whites did in similar situations.

As mentioned above, a number of studies report Asian-Americans spend more time on homework, a pattern evidently due in part to the greater demands for academic excellence placed upon them by parents. While it is not clear to what extent the greater homework effort is a result of more interest on the part of the students, studies such as Mau's (1997) also reported that Asian immigrants and Asian-Americans spent significantly more time on homework than American Whites. Peng & Wright (1993) found that, on average, a sample of Asian-American students spent 6.81 hours per week versus 5.66 hours for Whites, with a standard deviation of approximately 6 hours/week. Hafner, Ingels, Schneider, & Stevenson's (1990) descriptive summary of the NELS:88 database demonstrates that Asian-American eighth-graders outperform students from all other ethnic groups in mathematics and that Asian-American students spend much more time with homework than students from other groups, indicating a possible causal relationship between the higher performance and greater homework effort.

Reglin & Adams (1990) examined a small sample (29 Asian-American and 70 other students at one school) and found that 62% of the Asians completed 6 or more hours of homework each week, compared to 34% of the other students.

They also found that fewer Asian-American students held jobs: 45% versus 66% for Whites. Students who hold jobs must divide their efforts between a greater number of responsibilities, and the lower rate of job-holding by Asian-American students might contribute in some measure to their greater school performance. Also, more Asian-American students in one investigation report having a place at home to study: 59% versus 40% (Kao, 1995), a fact which may only reflect the greater emphasis on education in Asian-American families, but which might conceivably also contribute to higher academic performance.

Peng & Wright (1994) employed the NELS:88 database to investigate the home environments and educational activities of Asian-American students to other minorities and discovered that Asian-Americans spent more time on outside educational activities such as going to museums and libraries, and more time attending extracurricular lessons such as art and dance than other groups. They concluded that home environment differences, along with higher levels of extracurricular educational activities was responsible for much of the school achievement difference between Asian-Americans and other groups, with extracurricular activities having a negative relationship with academic achievement. However, Peng et al. (1984) also found that compared to Whites, Asian high school students less frequently participate in athletics but more frequently join honorary or academic clubs than vocational clubs.

In an important study of the educational beliefs and behaviors of adolescents, Chen & Stevenson (1995) surveyed and tested Asian-American (N = 304) and White students (N = 1,958). Employing a mathematics achievement test, they found that Asian-Americans scored approximately 1/3 of a standard deviation higher (the standard deviation was approximately 8.75 points). Holding an outside job was associated with a reduced performance on the test by three points and dating was associated with reduced scores of one point. Each day of school skipped reduced test performance by an average of .36 points.

Chen & Stevenson also employed measures of self-satisfaction and achievement expectations. Asian-Americans scored higher on both scales. These researchers posed the following question to examine whether students thought they were meeting the standards of their parents and of themselves: "Let's say there is a math test in which there are 100 points. The average score in your class is 70. What score do you think you would get? What score would you be satisfied with? What score would your parents be satisfied with?" (Chen & Stevenson, 1995, p. 1221). The difference between expected scores and satisfaction scores serves as an index of standards. White students set significantly lower standards than Asian-American students.

The researchers also conducted regression analyses that added two variables that differentiated between White and Asian-American students: students' perceived value of education and attitudes toward mathematics. To measure the value of education, students were asked how important it was to themselves and to their parents to go to college and achieve high grades; a mean score was taken from the responses. To measure attitudes towards mathematics, the researchers used the mean of survey items asking the degree to which the students liked mathematics, how interested they were in studying it, how proficient they viewed themselves to be at it, and how easy it was for them to learn. Once these variables were controlled for, the difference in math achievement between Asian-Americans and Whites was no longer statistically significant. “Taken together, the factors we have identified [attitudes toward math and education] can explain the bases for the differences in performance of different cultural groups” (Chen & Stevenson, 1995, p. 1230).

Chen & Stevenson (1995) discovered that Asian-American and White students enrolled in advanced math courses (pre-calculus or calculus) earned virtually identical scores on the math achievement test, implying that “an important variable in accounting for the overall difference between Asian-American and Caucasian-American students in mathematics achievement is the larger number of Asian-American students who were enrolled in the advanced mathematics classes” (Chen & Stevenson, 1995, p. 1228). Chen and Stevenson found that 55% of the Asian-American students and 37% of the White students were taking precalculus courses. Asian-American students were twice as likely (9.6%) than Whites (4.8%) to be taking calculus.

In another study of students at four highly selective schools (Elliott, Strenta, Adair, Matier, & Scott, 1996), it was found that Asians (N=582) had taken more Advanced Placement courses than Whites (N=3534) in each of four categories: biology (33% vs. 22%); chemistry (33% vs. 20%); physics (24% vs. 18%) and calculus (22% vs. 14%). Grades were similar for both groups, differing from less than a tenth to less than a fourth of a standard deviation. SATV was identical for Whites and Asians but Asian SATM was .29 standard deviations higher than White SATM.

Fuligni (1997) studied immigrant secondary students and found that Asian immigrants were over-represented in higher level courses. Over 40% of Asian-American students took trigonometry during the tenth grade, versus approximately 20% of immigrant White students. Over 80% of the students with Asian backgrounds were taking college placement English during the tenth grade whereas only 48% of the students of European heritage were. Likewise, Schneider & Lee (1990) found that most Asian students from both schools in their study were in advanced classes and that tracking into high-level classes began in primary school for most of the students.

These studies corroborate the best data available on the ethnic breakdown of participation in advanced placement and honors high school courses, the U.S. Department of Education's 1998 High School Transcript Study (see Table 2.1). The Transcript Study reveals that Asian-American students were more likely than

Whites to take each of nine math and science courses in high school. Asian-Americans were more than twice as likely, for example to take AP or honors chemistry (10% versus 4.8%), and one and a half times as likely to take physics (46.4% to 30.7%) or calculus (12.1% to 18.4%). Asian-Americans were also almost twice as likely to take AP or honors calculus (13.4% to 7.5%) and more than twice as likely to take AP or honors physics (7.6% to 3.0%).

These patterns raise the important issue of whether the underprediction of Asian-American freshman college grades be due at least in part to the fact that more of them arrive at college and enroll in freshmen-level math and science courses after obtaining greater exposure to the subject material during high school.

SUMMARY: RATIONALE FOR CHOICE OF VARIABLES

"From an academic perspective, the finding is very positive: Asians do well in school because their parents expect it, their teachers expect it, and their peer group expects it." (Schneider & Lee, 1990, p. 374).

The findings presented in this chapter demonstrate that Asian-Americans and Whites differ significantly on a number of dimensions related to school achievement, dimensions which each plausibly account for a portion of the Asian-American underprediction observed when the SAT is used to predict college freshmen grades. Asian-Americans face a greater degree of pressure from parents to succeed academically. Their parents demand higher standards of performance.

Evidence suggests Asian-American students believe success in life is more dependent upon success in school than White students. They experience a heightened fear of failure in the academic realm.

Perhaps as a consequence of these factors, Asian-American students demonstrate a higher degree of school engagement as measured by the amount of time spent on homework, and a greater focus on academics in their lives, as measured by less extracurricular involvement. They might experience a higher level of peer support for academic achievement and might possess a greater belief that achievement depends more on effort rather than ability, a believe that possibly leads to perseverance in the face of academic difficulty. And finally, Asian-Americans enter college more prepared, having taken a greater proportion of advanced courses in high school, a fact which could lead to greater levels of achievement in freshmen college coursework.

Table 2.1

Percentage of High School Graduates Taking Selected Mathematics and Science Courses in High School, by Race: 1998		
Course	**White**	**Asian-American**
Analysis/pre-calculus	25.0	41.3
Calculus	12.1	18.4
AP calculus	7.5	13.4
AP/Honors biology	16.7	22.2
Chemistry	63.2	72.4
AP/Honors chemistry	4.8	10.9
Physics	30.7	46.4
AP/Honors physics	3.0	7.6
Bio, chem, & physics	27.6	40.2
Source: U.S. Dept. of Education, National Center for Education Statistics, "1998 High School Transcript Study."		

Chapter III: Method

SUBJECTS

Subjects for the study were Asian-American, Hispanic and White freshmen at the University of Texas who matriculated for the first time during the summer or fall of 2000 for the pilot study (data collected in spring 2001), or the summer or fall of 2001 for the main study analyzed herein (data collected in spring of 2002). Only students who returned to school in the spring of their freshmen year and indicated the intention to major in business, engineering, or natural sciences were included in the samples.

3,721 US citizens enrolled as freshmen at UT in 2000 and expressed the intention to major in one of those areas; a similar number enrolled at UT in 2001. Because data on the ethnicity of students is no longer released by the registrar, an informal analysis of the ethnic origins of student names was performed both years. For the 2001-2002 cohort, the ethnicity name analysis procedure was correct in 92% of the cases where respondents provided a self-report of their ethnicity on their returned survey, indicating the procedure was an efficient substitute for official ethnic data maintained by the university.

PROCEDURE

The names, addresses, e-mail addresses, college, and declared major of all subjects were obtained from the registrar's office. A survey questionnaire, described below, was mailed to the local addresses of all eligible presumptive Asian-American and Hispanic freshmen above who returned for their spring semesters, as well as a similar-sized sample of eligible presumptive non-Asian/non-Hispanic freshmen who returned. Data from the registrar's office indicated that approximately 2% of freshmen who attended in the fall did not return in the spring.

Subjects' ethnicity was verified through self-report on a survey item. Approximately 100 additional presumptive non-Asian/non-Hispanic subjects are needed in order to obtain more equal numbers in the Asian-American and White samples. A small number of those surveyed in the presumptive non-Asian/non-Hispanic sample were omitted from analysis because they are not White, and because the response rate of White subjects is likely to be approximately five percent less that the Asian-American response rate (Gary Hansen, personal communication). Black freshmen were not included in this study because their small numbers precluded meaningful statistical analyses from being performed.

Incentives

The cover letter mailed with the survey instrument described material incentives for participation. These incentives were intended to reduce the overall cost of the study by improving response rate and thereby eliminating the need for a second mailing. All subjects were given the chance to participate in a drawing each year where three prizes (gift certificates from local merchants) were awarded—one worth $300 and two worth $100. All respondents who indicated they wanted to participate had their names placed in the drawing. The winners were selected, notified, and sent their prizes within three months of the initial survey mailing.

Obtaining Grade and SAT Data

The survey mailings included a consent form allowing the release of grade and SAT data by the university to the dissertation supervisor. The researcher collected the consent forms and forwarded them to the registrar's office. At the end of the spring semester of 2001 and 2002, electronic copies of transcript and SAT data for freshmen respondents were obtained from the registrar. The transcript data contained grade information for all courses the respondents enrolled in during the fall and spring semesters of their freshman term.

In the spring of 2001, the survey was mailed to a pilot sample of freshmen. Based on the analysis of data from 2001 sample, modifications were made to several survey items in order to mitigate ceiling or floor effects and to balance out the proportion of items to be reverse coded on two of the scales. In the spring of 2002, the revised survey was mailed to a sample of 2,543 freshmen, and 1,032 responses were received, for a response rate of 41%.

INSTRUMENT

The survey instrument administered (see Appendix) consists of three conceptually distinct item clusters: demographic, academic, and social-cognitive. Demographic items include age, gender, ethnic group, parents' level of education, language spoken in the home, years family has lived in the United States. The academic cluster consists of a series of yes/no items to identify whether or not various high school science and math courses were taken by the subject, and an item asking subjects to identify their proposed major. The social-cognitive cluster includes three item clusters examining students' view of ability, fear of academic failure, peer support for academics, grade goals, and an item measuring parental educational aspiration for the subject.

The first section of the instrument consists of 20 items assessed on a 4-point Likert scale (A = false to D = very true). These 20 items include scales for view of ability, fear of academic failure, and peers support for academics. The scales relating to view of ability (8 items) and fear of academic failure (8 items) used by Eaton and Dembo (1997) in their study of the motivational beliefs among high school students. The former scale had a Cronbach alpha of .60 and the latter a Cronbach alpha of .68 in the Eaton & Dembo sample. A four-item scale measuring peer support for academics was employed by Fuligni (1997) in his study of the academic achievement of immigrant adolescents. The Cronbach alpha for the scale was .79 in the Fuligni sample. Some items from these scales have been slightly modified to fit the current testing population.

The second section of the instrument consists of seven items. For items 25-28, subjects are asked to check yes or no to indicate whether or not various math and science courses were taken in high school. Items 21-24 ask respondents to report their year of high school graduation, the size of their high school graduating class, and their assessment of the quality of education and the quality of social life at their high school. These items have no expected relation to differential prediction and should not decrease it. Their inclusion in the survey was intended to assist in evaluating whether the explanatory variables above have a unique logical relationship to differential prediction.

The third section of the instrument consists of 7 items developed to measure respondents' overall grade goal for the semester when the survey was completed, respondents' beliefs about the amount of schooling their parents wanted them to attain, and behaviors related to academic engagement and academic distraction. The first of these items asks subjects what is the minimum GPA for the current semester they could achieve that would be acceptable to themselves. One item asks students what the minimum level of education would be acceptable for them to achieve in the view of their parents, ranging from high school diploma to professional degree. The five other items in this section are borrowed from a dissertation survey developed by another UT graduate student, and relate to student engagement—amount of time spent studying each week, class attendance and note-taking behavior, and academic distraction—participation in non-curricular social activities, and whether and how much the student is working an outside job.

The fourth and final section of the instrument consists of nine demographic items, including the subject's gender, age, the parents' level of education (two items—one for each parent), ethnic background (three items), and two items designed to measure acculturation. The items designed to measure acculturation are five-point Likert scales inquiring whether and how much English is spoken in the subject's home and how long the subject's family has been residing in the United States. The first of the three items regarding ethnicity ask respondents to select among Asian, Hispanic, African-American and Caucasian groups. The following item is directed at the subjects who respond "Asian" to the previous item. It asks respondents to select among five Asian cultural groups the one that best describes the subject. The third ethnicity item is directed at students who identify themselves as Hispanic on the earlier item and provides five cultural groups to select from.

EXPLANATORY VARIABLES

The general hypothesis tested by this study is that the set of explanatory variables discussed in chapter 2 will, when included in regression models for SAT and grades, decrease the intercept bias that exists between Asian-Americans and

Whites and Hispanics, and the intercept bias that exists between males and females. Quantitative courses will be a special focus of investigation in light of Ramist et al.'s (1994) findings that the greatest proportion of Asian-American underprediction once differential grading standards are taken into account occurs in such courses.

The explanatory variables for this hypothesis are defined as follows:

1. View of ability (Sum of 8 items – 2, 4, 5, 9, 10, 14, 16, 19) From Eaton & Dembo (1997), this scale had an internal consistency of alpha = .60 in their sample. The mean of these 4-point Likert scale items will be used. Some items are recoded.
2. Fear of academic failure (Sum of 8 items – 1, 3, 7, 11, 12, 17, 18, 20) This scale was employed by Eaton & Dembo (1997), where it showed an internal consistency of alpha = .68. The mean of these 4-point Likert scale items will be used. Some items are recoded.
3. Peer support for academics (Sum of 4 items – 6, 8, 13, 15) This scale was used by Fuligni (1997), who reported an internal consistency of alpha = .79. The mean of these 4-point Likert scale items will be used. Some items are recoded.
4. High school honors science curriculum: the sum of honors science courses taken, from zero to 4. (Sum of 4 items – 24-28)
5. Personal grade goals (Item 35)

6. Parental attainment expectation (Item 36)
7. Academic distraction (Sum of 2 items – 29, 30)
8. Academic engagement (Sum of 3 items – 32, 33, 34)

Chapter IV: Results

The results presented in this chapter consist of analyses from two datasets. The first was provided by the Measurement and Evaluation Center (MEC) and is composed of over 160,000 individual course grade records, with ethnic data and SAT scores for each record. The MEC dataset is intended to accomplish two purposes: 1) to provide a reliable assessment of the existence and magnitude of ethnic intercept bias in the SAT's prediction of freshman academic performance at the university and 2) to serve as a basis for the calculation of adjustments in course grades in order to compensate for the differential grading standards that exist across disciplines and courses. The second dataset is composed of mail survey responses, SAT scores, high school percentile ranks, and course grade data from a sample of 836 freshmen, most of whom were majors in business, engineering, and the natural sciences.

Findings from the MEC dataset are presented first. They are followed by an examination of ethnic intercept bias in the survey dataset. The survey dataset provides the opportunity to test the hypothesis that the set of explanatory variables included in the survey will, along with adjusted measure of student performance, reduce or eliminate any intercept bias that is found. Finally, using the survey dataset, the analyses of ethnic intercept bias are repeated in context of gender, in order to test the hypothesis that the survey variables and grade adjustments will reduce or eliminate intercept bias there.

In analyzing both the MEC and survey datasets, dummy variables were employed to indicate the magnitude and significance of intercept bias. In the ethnic context, Asian-Americans were assigned as the reference group; in the gender context, females were assigned as the reference group. Intercept bias is defined as the deviation of a group's intercept from the reference group's intercept. It is expressed in terms of effect size (d), i.e., the deviation from the reference group intercept as expressed on the four-point grading scale, divided by the standard deviation of grade or GPA.

MEC FINDINGS

As a potential basis for indexing the relative difficulty of course grades throughout the freshman curriculum, a special data request was made of the campus Measurement and Evaluation Center (MEC) based on enrollment data of all participants in the survey dataset. Course grade and SAT scores were obtained for every individual in every course and section in which at least one person from the survey response sample had enrolled. Because of the extensive size of the total survey response sample, the resulting MEC dataset contained the grades of virtually every freshman student at the university who enrolled in the summer or fall of 2000 and 2001, as well as the grades of many non-freshmen who enrolled in lower division courses. A grand total of 197,761 grades (including Qs, Ws, Xs, and CRs) constituted the MEC dataset. The number of records for American Indian students was too small (599) for reliable analysis. After eliminating those records, and records without SAT scores or A-F letter grades, 160,145 records remained for inclusion in analyses. Included are records from 573 different courses and 4,413 unique course sections.

The MEC dataset, which provides ethnic information for each record, allowed the opportunity to examine ethnic intercept bias across the set of virtually all freshman courses in the university. This dataset provides a much more accurate measure of grade intercept bias at the university than the survey sample is able to achieve with GPA intercept bias.

For the MEC dataset, SAT (the sum of SATM and SATV) was employed to predict grades (mean=2.91, S.D.=1.11). This combination of predictors accounted for roughly 4% of the variance in grades ($R=.198$, $R^2=.039$). As found in many prior studies, the grades of Black and Hispanic students were over-predicted relative to Asian-American students. As found previously, the effect size of the over-prediction is small. Black students are over-predicted by an effect size of approximately .1 ($d=.09$; $p<.001$) and Hispanic students by somewhat more ($d=.14$; $p<.001$). Unlike the results reported in many prior studies, however, the White intercept is not significantly different from the Asian-American intercept ($d=.01$; $p=.083$). One group not commonly evaluated in studies of differential prediction, foreign students, is substantially under-predicted relative to Asian-Americans (d=.11; $p<.001$). As shown in Figure 4.1 and Table 4.1, the slopes of all four groups were slightly but significantly different from the slope for Asian-American students.

In the total MEC sample, just over 50% of all grades were from only 29 of the 573 courses taken by students in the survey sample. Table 4.2 and Figure 4.2 provide a listing and a representation of the distribution of all 29 courses, 13 of which are coded as science courses and 16 of which are coded as non-science. These courses can be conceptualized as a sort of common curriculum for freshman students and it is likely that the grading standards for these courses is somewhat more uniform, given the evidence that instructors adjust their grading to the aptitudes and performance of students in a course and the fact that students taking the most popular courses are "more average" than, for example, students in either remedial or advances courses. (However, as discussed below, certain sections of some of the most popular courses are reserved for honors students and for students who come from underperforming high schools.)

The remaining analyses of the MEC dataset analyzed only records from Year 2 of the project, the cohort which was sampled for the survey dataset. Dividing the top 29 courses into two groups—quantitative and scientific courses for majors, and non-science, non-quantitative courses—revealed some general patterns (see Figures 4.3 and 4.4 and Tables 4.3 and 4.4). Grades for the science course subset were lower (mean=2.60, S.D.=1.20) and the predictive efficiency of

SAT was higher (R=.316, R^2=.100). As found in prior studies, Black and Hispanic over-prediction was higher than for all courses together (d=.21, p<.001 and d=.20, p<.001, respectively). There was also a very small but significant over-prediction of White grades (d=.04; p=.021) and the under-prediction of foreign grades was much greater (d=.30; p<.001). With the exception of foreign students, there were no significant ethnic slope differences in the science course subset.

Grades in the non-science course subset were more similar to those in the overall dataset, both in terms of their descriptive characteristics (mean=2.89, S.D.=1.03) and their predictability by the SAT (R=.199, R^2=.039). The intercept differences were intermediate between those found in the overall dataset and the science course subset. Whites were over-predicted by d=.06 (p=.003); Blacks by d=.21 (p<.001) and Hispanics by d=.22 (p<.001). Foreign students were also over-predicted (d=.06) but this was not significant (p=.333). There were significant slope differences for Whites (p=.016) and Blacks (p=.008).

THE SURVEY DATASET

Survey Response Sample Characteristics

Of the 1,032 records in the total survey response sample, 836 were retained for analysis. Excluded were 196 records, including 39 records in which SAT data was unavailable, 3 for which a page of the survey form was left blank by a respondent, and others discarded on the basis of ethnic information. These

Figure 4.1

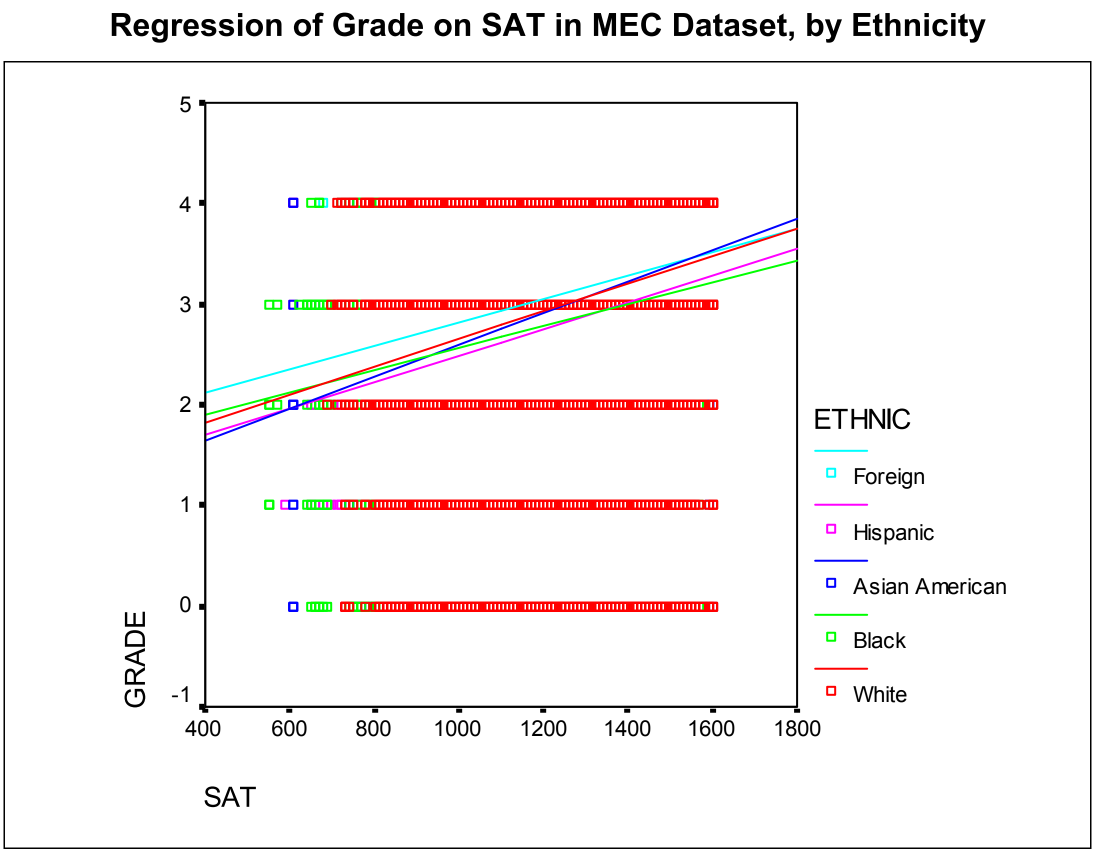

Regression of Grade on SAT in MEC Dataset, by Ethnicity
GRADE
SAT
5
4
3
2
1
0
-1
400
600
800
1000
1200
1400
1600
1800
ETHNIC
Foreign
Hispanic
Asian American
Black
White

Table 4.1

Ethnic Intercept and Slope Bias for Regression of Grades on SAT in MEC Dataset

Parameter		B	Std. Error	Beta	t	Sig.
Intercept	White	.012	.007	.005	1.732	.083
	Black	-.099	.015	-.017	-6.527	.000
	Hispanic	-.151	.010	-.047	-15.486	.000
	Foreign	.126	.019	.017	6.563	.000
Slope	White x SAT	.000	.000	-.108	-4.069	.000
	Black x SAT	.000	.000	-.093	-5.024	.000
	Hispanic x SAT	.000	.000	-.089	-3.896	.000
	Foreign x SAT	.000	.000	-.069	-2.728	.006

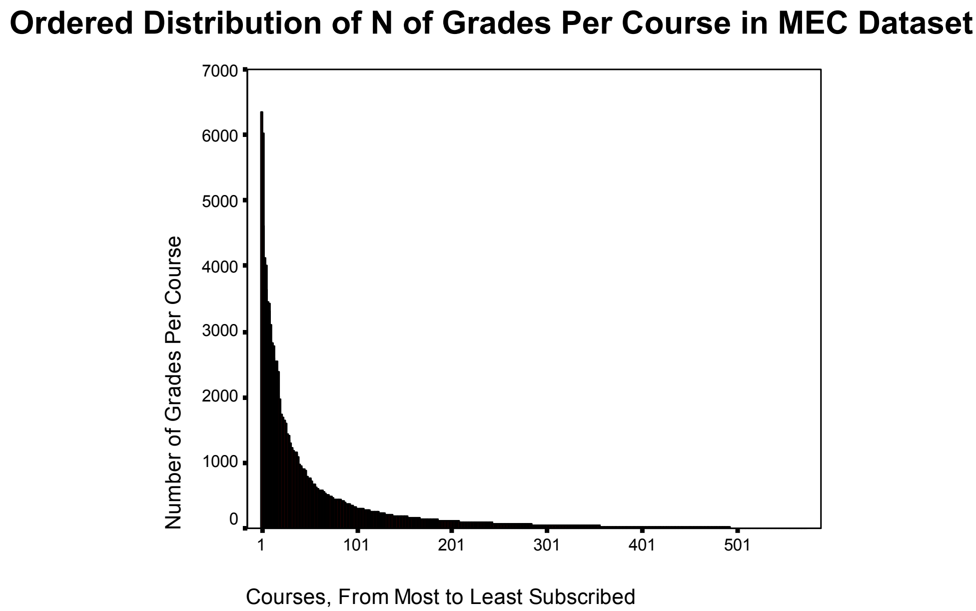
Dependent Variable: GRADE; S.D.=1.11

Table 4.2

Most Subscribed Courses in MEC Dataset, Comprising 50% of all Grades in Dataset

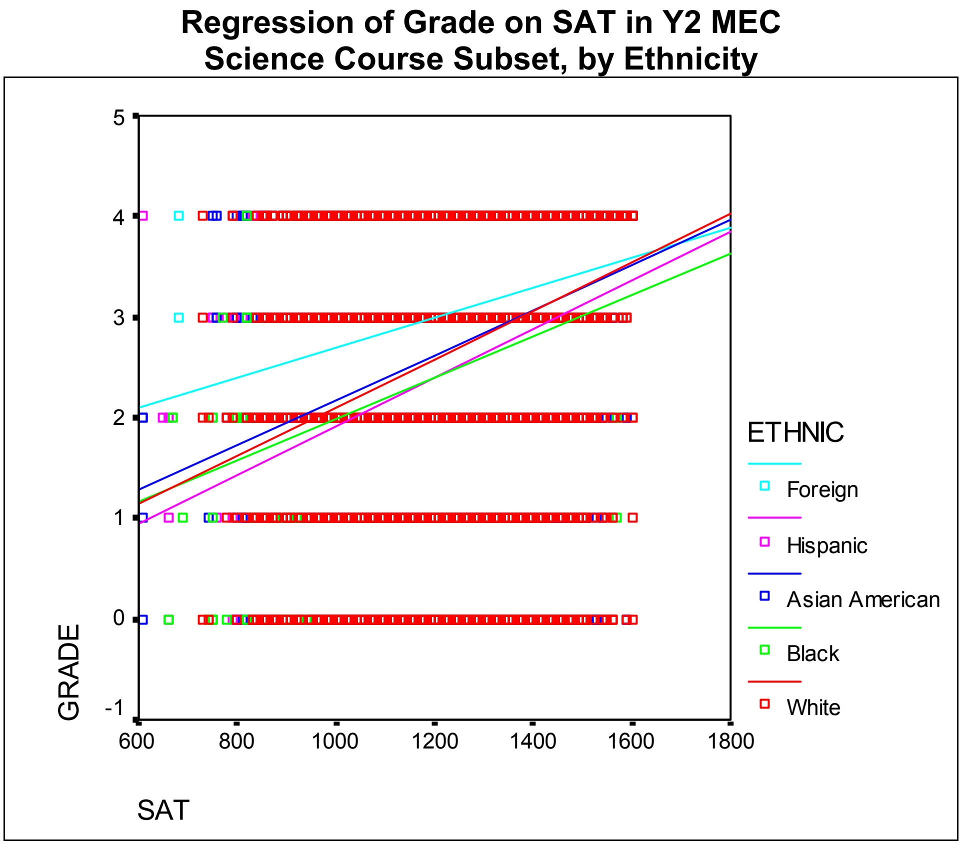
Dept.	Course	# Recs	Cum.% Recs	Code*	Dept.	Course	# Recs	Cum.% Recs	Code*
Chemistry	301	6378	3.97%	S	Rhetoric	306	2557	36.38%	N-S
Psychology	301	6059	7.74%	N-S	Govern-ment	312L	2417	37.88%	N-S
Economics	304K	4637	10.62%	S	Philo-sophy	304	2408	39.38%	N-S
Government	310L	4132	13.19%	N-S	MIS	311F	2019	40.64%	N-S
Sociology	302	4012	15.69%	N-S	Nutrition	311	1966	41.86%	N-S
Chemistry	302	3663	17.97%	S	MIS	310	1730	42.94%	N-S
Math	408C	3471	20.13%	S	Phys. Ed.	106C	1709	44.00%	N-S
Theatre/ Dance	301	3443	22.27%	N-S	Classical Civ.	303	1701	45.06%	N-S
History	315K	3322	24.33%	N-S	Chemistry	304K	1656	46.09%	S
Math	408D	3115	26.27%	S	Chemistry	610A	1646	47.11%	S
Economics	304L	2858	28.05%	S	Physics	103M	1603	48.11%	S
Biology	211	2850	29.82%	S	Comm. Science	315M	1594	49.10%	N-S
History	315L	2802	31.57%	N-S	Physics	303K	1431	49.99%	S
Astronomy	301	2613	33.19%	S	Anthro-pology	301	1425	50.88%	N-S
Biology	212	2564	34.79%	S	*S=Science; N-S=Non-Science				

Figure 4.2



Ordered Distribution of N of Grades Per Course in MEC Dataset
7000
6000
5000
4000
3000
2000
1000
0
Number of Grades Per Course
1
101
201
301
401
501
Courses, From Most to Least Subscribed

Figure 4.3



Regression of Grade on SAT in Y2 MEC
Science Course Subset, by Ethnicity
GRADE
5
4
3
2
1
0
-1
600
800
1000
1200
1400
1600
1800
SAT
ETHNIC
Foreign
Hispanic
Asian American
Black
White

Table 4.3

Intercept and Slope Bias for Science Subset Grades in Y2 MEC Dataset

Parameter		B	Std. Error	Beta	t	Sig.
Intercept	White	-.046	.020	-.019	-2.305	.021
	Black	-.251	.048	-.039	-5.234	.000
	Hispanic	-.236	.028	-.068	-8.271	.000
	Foreign	.354	.058	.044	6.105	.000
Slope	White x SAT	.000	.000	.018	.236	.814
	Black x SAT	.000	.000	.059	.978	.328
	Hispanic x SAT	.000	.000	-.036	-.551	.582
	Foreign x SAT	-.002	.000	-.243	-3.234	.001

Dependent Variable: GRADE; S.D.=1.20

Figure 4.4

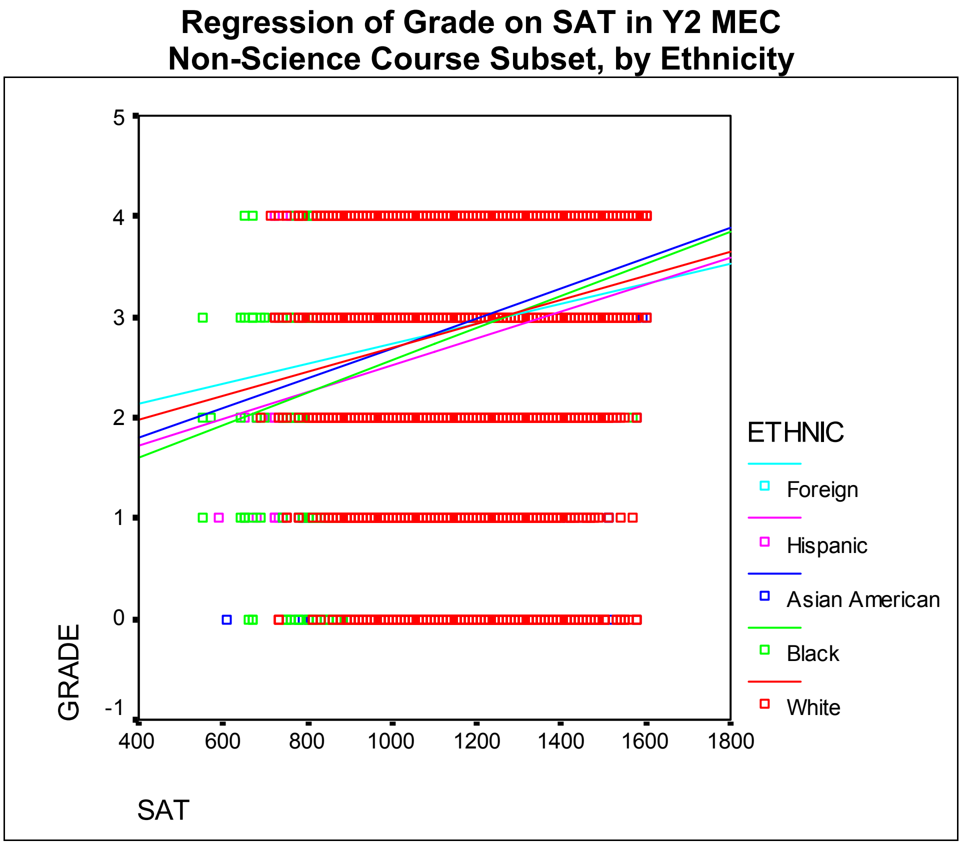

Regression of Grade on SAT in Y2 MEC
Non-Science Course Subset, by Ethnicity
GRADE
5
4
3
2
1
0
-1
400
600
800
1000
1200
1400
1600
1800
SAT
ETHNIC
Foreign
Hispanic
Asian American
Black
White

Table4.4

Intercept and Slope Bias for Non-Science Subset Grades in Y2 MEC Dataset

Parameter		B	Std. Error	Beta	t	Sig.
Intercept	White	-.057	.019	-.027	-2.996	.003
	Black	-.218	.039	-.041	-5.555	.000
	Hispanic	-.232	.026	-.078	-9.068	.000
	Foreign	-.059	.061	-.007	-.969	.333
Slope	White x SAT	.000	.000	-.184	-2.403	.016
	Black x SAT	.001	.000	.135	2.633	.008
	Hispanic x SAT	.000	.000	-.072	-1.086	.278
	Foreign x SAT	.000	.000	-.062	-.950	.342

Dependent Variable: GRADE: S.D.=1.03

included 6 respondents did not report ethnicity, and 27 who reported “Other” as their ethnicity. African-American respondents were also excluded because the 30 records did not provide enough data for reliable analysis.

Finally, of the 156 respondents who identified themselves as Hispanic, only the 132 who reported their nationality/ethnic origin as Mexican-American on Item 45 were retained. Two respondents who answered Cuban, 2 who answered Puerto Rican, 11 who answered Central or South American, and 9 who answered “Other” were excluded. This was done for the practical reason that Mexican-Americans are the object of particular concern and interest by contemporary American educators, and for the technical reason that retaining such small numbers of various other Hispanic nationalities would unnecessarily complicate the interpretation of these analyses.

Missing data rates for the explanatory variables were low (see Table 4.5), especially given that the five of the variables were defined as sums of values from multiple survey items. All missing data points for the explanatory variables were replaced by the variable mean. All missing data rates were <2% except in the case of HONORS, defined as the sum (0-4) of high school honors/advanced placement science courses completed by the respondent. The relatively high incompletion rate of items relating to this variable might be due to respondent uncertainty as to whether some of their courses met the definition of honors or advanced placement.

The similarity of the survey sample to the cohort of university freshman at large is illustrated in Tables 4.6 and 4.7. The survey dataset is comparable to the population of university freshmen in regard to SAT scores, but it is somewhat more elite in terms of high school class rank and the percentage who graduated in the top 10% of their high school class. The great majority of survey respondents were majors in one of three colleges: business administration; natural sciences; and engineering. The natural science majors in the survey sample averaged a GPA approximately half a standard deviation above the cohort of natural science freshmen as a whole. Respondents from the business school had GPAs 1/7 of a standard deviation lower than all business freshmen together. Engineering respondents averaged around 1/6 of a standard deviation above the average for engineering freshmen.

Analysis of Intercept Bias in the Ethnic Context

Tables 4.8 and 4.9 illustrate the relationships between GPA and the standard predictor variables (SATM, SATV, and HSPR) in the survey dataset, both overall and within each ethnic group. The SAT scores of Mexican-American students are notably lower (almost a standard deviation) than those of either Asian-Americans of Whites. The high school percentile ranks however are quite comparable, with Mexican-American students having a slightly higher academic standing in high school than the other groups. Yet their college GPAs are lower by slightly more than half a standard deviation.

Table 4.5

Missing Data Rates for Explanatory Variables in Survey Dataset

Variable	Valid	Missing	%Missing
HONORS	809	27	3.23%
ABILITY	824	12	1.44%
PEER	832	4	0.48%
FEAR	832	4	0.48%
PATTAIN	830	6	0.72%
GOAL	836	0	0.00%
DISTRACT	836	0	0.00%
ATTEND	836	0	0.00%
NOTES	834	2	0.24%
STUDY	834	2	0.24%

Table 4.6

Profile of Summer/Fall 2001 Freshmen Population and Survey Sample

	Dataset	
Category	**University**	**Survey**
SATT	1217	1230
SATV	595	591
SATQ	622	639
High School Percentile Rank	86	91
% in Top Tenth of H.S. Class	50.3	67.3

Note: University data provided by the Office of Institutional Research

Table 4.7

Cumulative Grade Point Averages Of Freshmen Students By Dataset, College, And Gender Fall 2001

	Dataset					
	University			Survey		
College	**Men**	**Women**	**Total**	**Men**	**Women**	**Total**
Business	3.26	3.26	3.26	3.16	3.16	3.16
Engineering	2.92	3.21	2.98	3.05	3.15	3.10
Natural Sciences	2.73	2.84	2.79	3.19	3.14	3.16

Note: University data provided by the Office of Institutional Research; Survey Dataset contained some participants enrolled in colleges other than those listed above.

In this sample, SATM accounts for almost twice as much variance in GPA as does SATV (.154 vs. .084) though there are differences among the ethnic groups. SATV accounts for approximately twice as much variance in GPA for Mexican-Americans than for Asian-Americans and Whites, and HSPR accounts for almost four times as much variance among Asian-American and White GPA as it does among Mexican-Americans. Combined, the SATM, SATV, and HSPR account for .296 of the variance in Asian-American GPA, for .259 of the variance in White GPA, and for only .192 of the variance in Mexican-American GPA.

With regard to intercept bias, neither SATV, SATM, HSPR, or combinations thereof differentially predict the GPAs of Whites relative to Asian-Americans, yet all significantly over-predict the GPAs of Mexican-American students (see Figures 4.5-4.7 and Tables 4.10-4.14). The SATV over-predicts Mexican-American GPA by $d=.46$. ($p<.001$), while the SATM does so only by $d=.21$ ($p=.036$). HSPR over-predicts Mexican-American GPA by $d=.63$ ($p<.001$). There are no significant slope differences at the alpha=.01 level, although the slope for Mexican-Americans is significantly different for SATV and GPA ($p=.048$).

In college admissions, the SATs together, and the combination of the SATs and HSPR are most frequently employed in decision-making. As shown in Tables 4.13 and 4.14, no significant slope differences exist in using these combinations of predictors to predict GPA, and the intercept for Whites is not significantly different from that of Asian-Americans. However SATM, SATV together over-predict Mexican-American performance by d=.22 (p=.031) and the combination of SATM, SATV, and HSPR over-predicts even more, by d=.30 (p=.001).

The hypothesis of the study is that the inclusion of a set of explanatory variables into the prediction equation will reduce or eliminate intercept bias. As shown in Table 4.15, in predicting GPA, these variables do not function identically across ethnic groups. Table 4.16 and Figure 4.8 reveal the average scores for each ethnic group on the nine variables included on the student survey and illustrate the ethnic differences on these variables. Effect size for the average differences among the three ethnic groups varied widely from d=.05 for peer support, to d=.32 for parental desire for child's educational attainment. As illustrated in Tables 4.17 and 4.18, the inclusion of these variables as a set into a regression equation where SATM, SATV are entered first does not result in a significant decrease in Mexican-American over-prediction. Intercept bias decreases insignificantly from d=.22 (p=.031) to d=.21 (p=.026) with the addition of the explanatory set. When the regression equation originally includes SATM, SATV, and HSPR, if the explanatory set is entered, the intercept bias decreases insignificantly from d=.30 (p=.001) to d=.28 (p=.002). Partial regression plots of all nine predictor variables and the three standard predictors revealed no evidence of non-linearity or undue effect of outliers.

A second dependent variable (ADJGPA) was generated in part to correct for the ceiling effect observed with GPA (see Figures 4.9 and 4.10). The adjusted GPA was calculated by using the MEC dataset to develop a prediction equation using the SAT scores corresponding to each grade in the MEC dataset. But first, all grades from a set of courses designed for students who arrive at college after being graduated from underperforming high schools were excluded. These courses are identified in the university course schedule; they are taken by students who have much lower SAT scores than the average freshmen, yet grades awarded in these classes average nearly the same as the mean university grade. Therefore these courses, along with a course known as "BA101," in which nearly all students are awarded As, were dropped for the analysis.

For all remaining courses, a predicted grade was calculated from a regression equation that included SATM, SATV as predictors. Using this equation, the mean SAT scores for each of the courses (e.g., PSY 301, GOV 312) were employed to predict the grades in those courses. The predicted mean grade was then subtracted from the actual mean grade, which indexed each course's difficulty in comparison with the difficulty of the average course. The index values were then subtracted from all of the grades in the survey sample, and these revised, indexed grades were then used to calculate the adjusted GPA, which was then used in the analyses in place of the unadjusted GPA. The use of the adjusted GPA mitigated the ceiling effect substantially, as shown in Figure 4.10, and broadened the distribution of the dependent variable, as demonstrated in Figures 4.11 and 4.12, thereby allowing a more meaningful interpretation of the data.

The amount of variance accounted for increased from .159 to .173 as a result of employing ADJGPA. However, use of ADJGPA as a dependent variable

Table 4.8

Ethnic Group Differences on Standard Predictor Variables and GPA

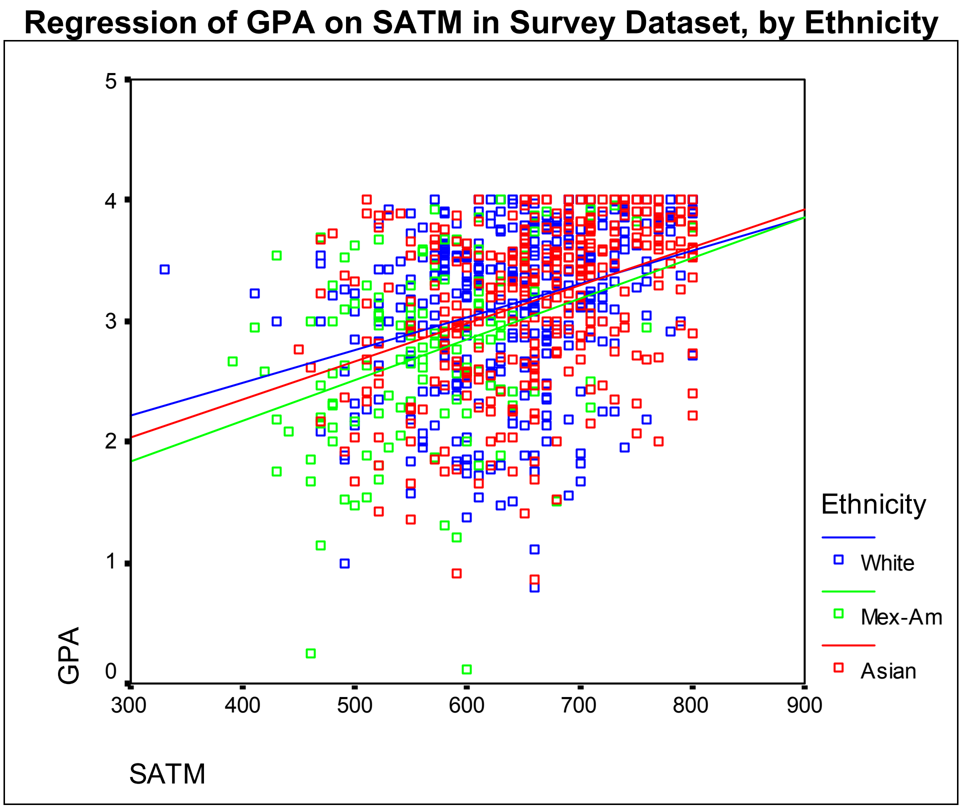
	Asian-American N=325		Mexican-American N=132		Caucasian N=379	
Predictor	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
SATM	661	83	570	81	643	77
SATV	588	89	541	79	612	78
SATT	1249	150	1111	148	1255	137
HSPR	91.26	8.85	92.24	7.67	90.63	9.77
GPA	3.18	0.68	2.75	0.75	3.16	0.68

Table 4.9

Standard Predictors of GPA in Survey Dataset, by Ethnicity

Predictors	Sample	R	R Square	Adj. R Sq.	Std. Error
(Constant), SATM	Total Sample	.393	.155	.154	.6501
	Asian	.386	.149	.147	.6260
	Mex-Am	.363	.132	.125	.7045
	White	.309	.095	.093	.6475
(Constant), SATV	Total Sample	.291	.085	.084	.676
	Asian	.215	.046	.043	.6628
	Mex-Am	.348	.121	.115	.7088
	White	.259	.067	.065	.6575
(Constant), HSPR	Total Sample	.379	.144	.143	.6542
	Asian	.425	.18	.178	.6145
	Mex-Am	.208	.043	.036	.7395
	White	.445	.198	.196	.6096
(Constant), SATM, SATV	Total Sample	.401	.161	.159	.6480
	Asian	.387	.150	.145	.6268
	Mex-Am	.386	.149	.136	.7001
	White	.326	.106	.101	.6444
(Constant), SATM, SATV, HSPR	Total Sample	.529	.280	.278	.6006
	Asian	.550	.302	.296	.5687
	Mex-Am	.459	.210	.192	.6771
	White	.509	.259	.253	.5875

Figure 4.5



Regression of GPA on SATM in Survey Dataset, by Ethnicity
5
4
3
2
1
0
GPA
300
400
500
600
700
800
900
SATM
Ethnicity
White
Mex-Am
Asian

Table 4.10

Ethnic Intercept and Slope Bias from SATM

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	White	.033	.049	.023	.671	.502
	Mex-Am	-.150	.072	-.078	-2.099	.036
Slope	White x SATM	.000	.001	-.183	-.650	.516
	Mex-Am x SATM	.000	.001	.069	.281	.779

Dependent Variable: GPA

Figure 4.6

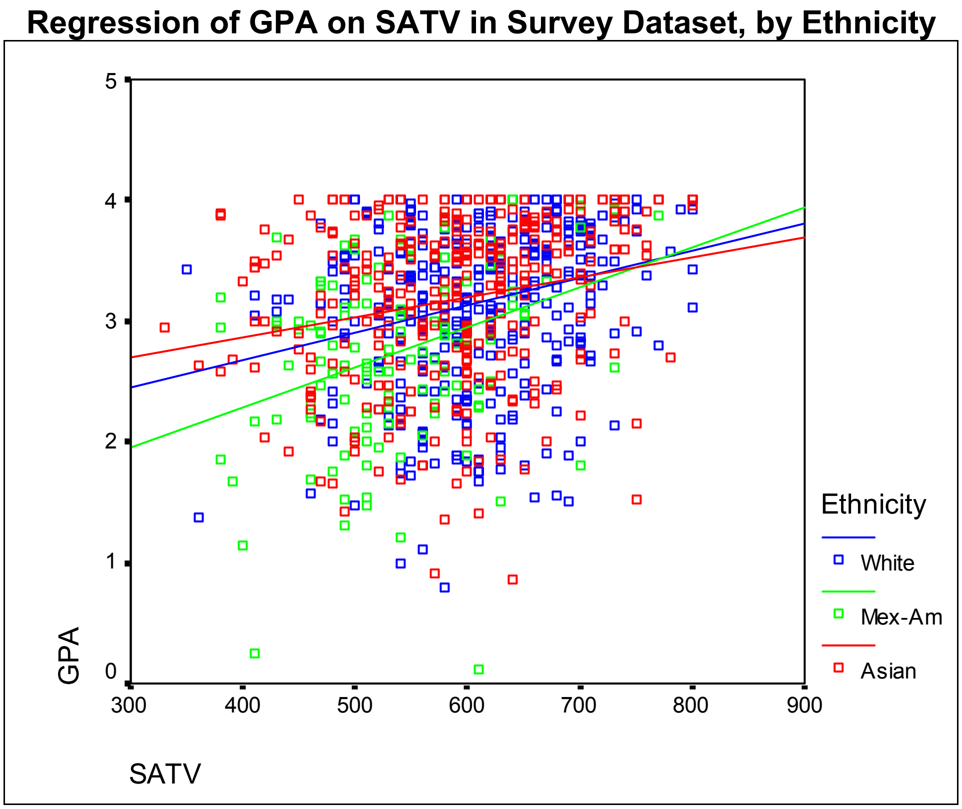

Regression of GPA on SATV in Survey Dataset, by Ethnicity
5
4
3
2
1
0
GPA
300
400
500
600
700
800
900
SATV
Ethnicity
White
Mex-Am
Asian

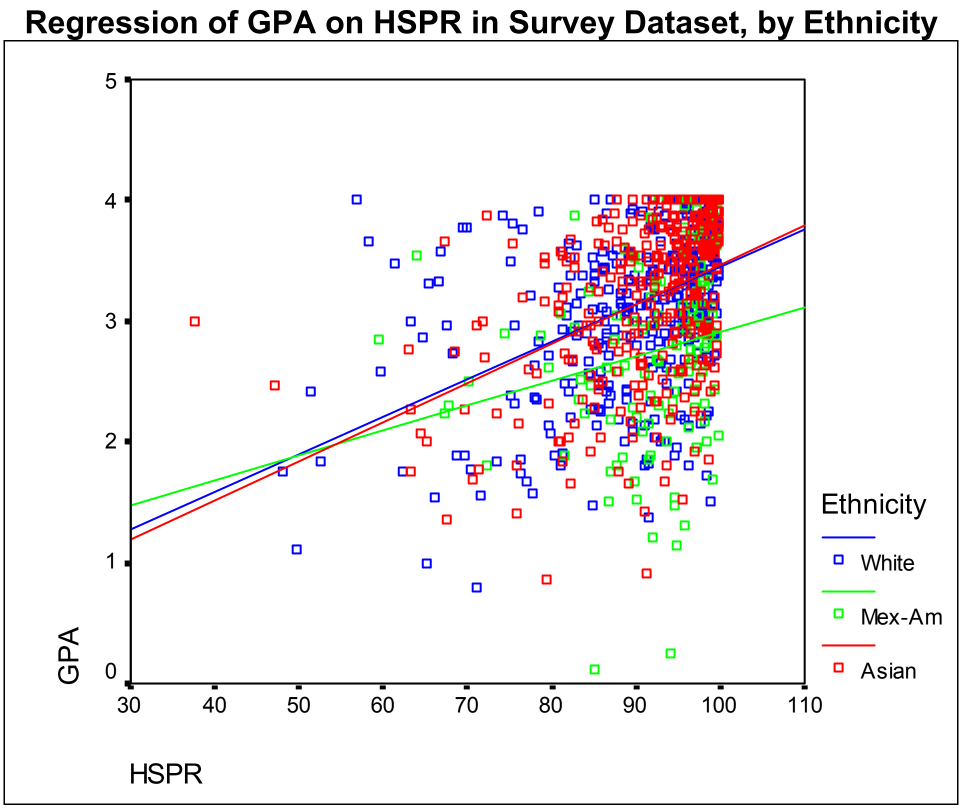
Table 4.11

Ethnic Intercept and Slope Bias from SATV

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	White	-.071	.051	-.050	-1.393	.164
	Mex-Am	-.325	.070	-.168	-4.632	.000
Slope	White x SATV	.001	.001	.269	1.015	.310
	Mex-Am x SATV	.002	.001	.472	1.977	.048

Dependent Variable: GPA

Figure 4.7



Regression of GPA on HSPR in Survey Dataset, by Ethnicity
5
4
3
2
1
0
GPA
30
40
50
60
70
80
90
100
110
HSPR
Ethnicity
White
Mex-Am
Asian

Table 4.12

Ethnic Intercept and Slope Bias from HSPR

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	White	-.001	.048	.000	-.012	.991
	Mex-Am	-.455	.065	-.235	-6.952	.000
Slope	White x HSPR	-.002	.005	-.100	-.298	.766
	Mex-Am x HSPR	-.012	.008	-.576	-1.462	.144

Dependent Variable: GPA

Table 4.13

Ethnic Intercept and Slope Bias in the Prediction of GPA by SATM + SATV

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	White	.008	.050	.005	.154	.878
	Mex-Am	-	.071	-	-	.031
Slope	White x SATM	-	.001	-	-	.212
	White x SATV	.001	.001	.381	1.256	.209
	Mex-Am x SATM	-	.001	-	-.777	.437
	Mex-Am x SATV	.002	.001	.434	1.396	.163

Dependent Variable: GPA

Table 4.14

Ethnic Intercept and Slope Bias in the Prediction of GPA by SATM + SATV + HSPR

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	White	.024	.046	.017	.511	.610
	Mex-Am	-[illegible]	.066	-[illegible]	-[illegible]	.001
Slope	White x SATM	-[illegible]	.001	-[illegible]	-[illegible]	.051
	White x SATV	.001	.001	.408	1.460	.145
	White x HSPR	-[illegible]	.005	-[illegible]	-.482	.630
	Mex-Am x SATM	.000	.001	-[illegible]	-.433	.665
	Mex-Am x SATV	.002	.001	.493	1.723	.085
	Mex-Am x HSPR	-[illegible]	.008	-[illegible]	-.726	.468

Dependent Variable: GPA

Table 4.15

Explanatory Variables as Predictors of GPA in Survey Dataset, by Ethnicity

Predictors	Sample	R	R Square	Adj. R Sq.	Std. Error	Sig.
(Constant), HONORS	Total Sample	.158	.025	.024	.698	.000
	Asian	.201	.040	.037	.665	.000
	Mex-Am	.221	.049	.041	.737	.011
	White	.070	.005	.002	.679	.174
(Constant), ABILITY	Total Sample	.020	.001	.020	.001	.560
	Asian	.036	.001	-.002	.678	.516
	Mex-Am	.039	.001	-.006	.756	.660
	White	.072	.005	.003	.679	.160
(Constant), PEER	Total Sample	.037	.001	.000	.706	.283
	Asian	.007	.000	-.003	.679	.902
	Mex-Am	.089	.008	.000	.753	.308
	White	.044	.002	-.001	.680	.389
(Constant), FEAR	Total Sample	.091	.008	.007	.704	.008
	Asian	.003	.000	-.003	.679	.955
	Mex-Am	.043	.002	-.006	.755	.627
	White	.133	.018	.015	.675	.010
(Constant), PATTAIN	Total Sample	.036	.001	.000	.706	.301
	Asian	.012	.003	.012	.003	.828
	Mex-Am	.000	.008	.000	.008	.996
	White	.010	.003	.010	.003	.841
(Constant), DISTRACT	Total Sample	.002	.001	.002	.001	.961
	Asian	.032	.002	.032	.002	.568
	Mex-Am	.007	.008	.007	.008	.933
	White	.031	.002	.031	.002	.541
(Constant), ATTEND	Total Sample	.273	.075	.073	.680	.000
	Asian	.269	.073	.070	.654	.000
	Mex-Am	.251	.063	.056	.732	.004
	White	.339	.115	.112	.641	.000
(Constant), NOTES	Total Sample	.038	.001	.000	.706	.278
	Asian	.071	.005	.002	.677	.201
	Mex-Am	.049	.002	-.005	.755	.578
	White	.048	.002	.000	.680	.352
(Constant), STUDY	Total Sample	.244	.059	.058	.685	.000
	Asian	.166	.027	.024	.669	.003
	Mex-Am	.346	.120	.113	.709	.000
	White	.265	.070	.068	.656	.000

Table 4.16

Ethnic Group Differences on Explanatory Variables

	Asian-American N=325			Mexican-American N=132			White N=379		
Predictor	**Mean**	**S.D.**	**d***	**Mean**	**S.D.**	**d***	**Mean**	**S.D.**	**d***
HONORS	2.22	1.26	0.17	1.85	1.36	-0.12	1.93	1.22	-0.05
ABILITY	15.59	2.85	0.23	14.09	3.25	-0.26	14.95	3.04	0.02
PEER	11.54	2.5	0.07	11.38	2.81	0.01	11.14	2.62	-0.08
FEAR	19.32	2.87	0.32	17.72	3.04	-0.21	18.03	3	-0.11
PATTAIN	2.68	0.84	0.48	2.18	0.66	-0.23	2.16	0.62	-0.25
DISTRACT	4.46	1.39	-0.15	4.6	1.84	-0.06	5.02	1.5	0.21
ATTEND	3.05	1.33	-0.05	3.28	1.17	0.13	3.01	1.25	-0.08
NOTES	2.38	0.81	-0.11	2.65	0.82	0.22	2.38	0.87	-0.11
STUDY	3.22	1.06	0.17	2.96	1.07	-0.08	2.95	1.06	-0.09

* Weighted standardized differences in mean explanatory variable scores among ethnic groups

Figure 4.8

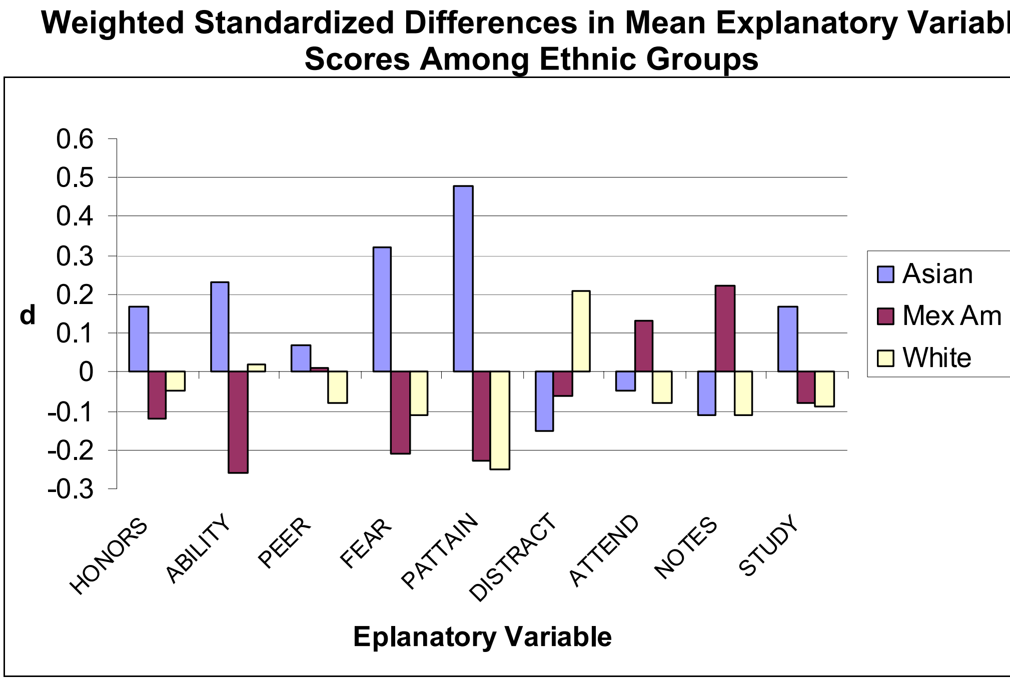

Weighted Standardized Differences in Mean Explanatory Variable Scores Among Ethnic Groups
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
d
HONORS
ABILITY
PEER
FEAR
PATTAIN
DISTRACT
ATTEND
NOTES
STUDY
Eplanatory Variable
Asian
Mex Am
White

Table 4.17

Ethnic Intercept Bias in the Prediction of GPA by SATM + SATV + Explanatory Variables

Set	Predictor	B	Std. Error	Beta	t	Sig.
1	(Constant)	.159	.293		.544	.587
	SATM	.003	.000	.332	8.577	.000
	SATV	.001	.000	.088	2.381	.017
2	HONORS	.031	.017	.056	1.856	.064
	ABILITY	-.009	.007	-.038	-1.238	.216
	PEER	.003	.008	.011	.367	.714
	FEAR	.007	.007	.032	1.024	.306
	PATTAIN	-.041	.030	-.044	-1.352	.177
	DISTRACT	.012	.014	.027	.887	.375
	ATTEND	.162	.017	.292	9.352	.000
	NOTES	-.044	.027	-.053	-1.662	.097
	STUDY	.105	.021	.158	4.941	.000
3	White	.033	.050	.023	.649	.517
	Mex-Am	-.151	.068	-.078	-2.225	.026

Dependent Variable: GPA; Standard Deviation of GPA: .71

Table 4.18

Ethnic Intercept Bias in the Prediction of GPA by SATM + SATV + HSPR + Explanatory Variables

Set	Predictor	B	Std. Error	Beta	t	Sig.
1	**(Constant)**	-1.636	.326		-5.025	.000
	SATM	.003	.000	.310	8.502	.000
	SATV	.001	.000	.079	2.289	.022
2	**HSPR**	.023	.002	.297	10.342	.000
3	**HONORS**	.003	.016	.006	.203	.839
	ABILITY	-.003	.007	-.015	-.510	.610
	PEER	.002	.008	.007	.245	.806
	FEAR	.002	.007	.009	.316	.752
	PATTAIN	-.036	.028	-.038	-1.262	.207
	DISTRACT	.014	.013	.031	1.099	.272
	ATTEND	.138	.017	.247	8.327	.000
	NOTES	-.029	.025	-.035	-1.158	.247
	STUDY	.094	.020	.142	4.700	.000
4	**White**	.031	.047	.022	.654	.513
	Mex-Am	-.203	.064	-.105	-3.171	.002

Dependent Variable: GPA; Standard Deviation of GPA: .71

Figure 4.9

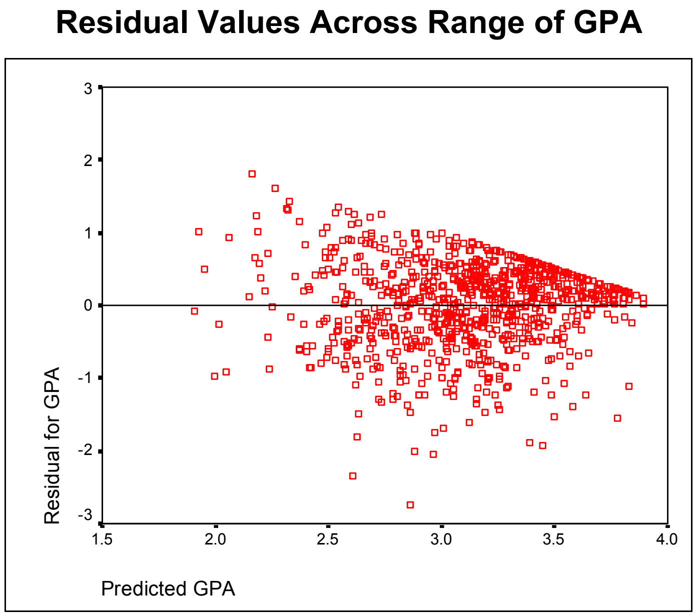

Residual Values Across Range of GPA
Residual for GPA
Predicted GPA
3
2
1
0
-1
-2
-3
1.5
2.0
2.5
3.0
3.5
4.0

Figure 4.10

Residual Values Across Range of ADJGPA

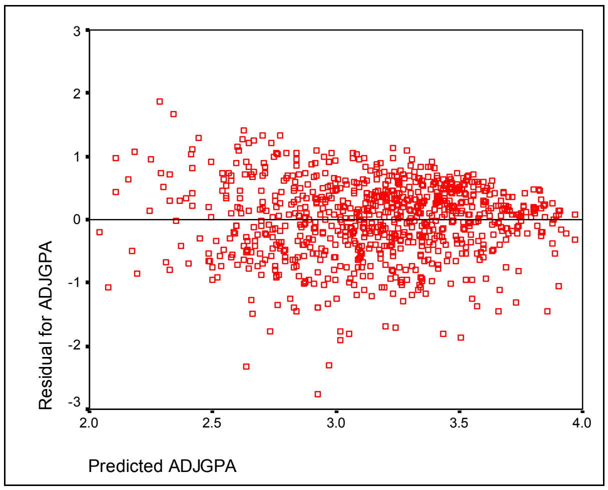
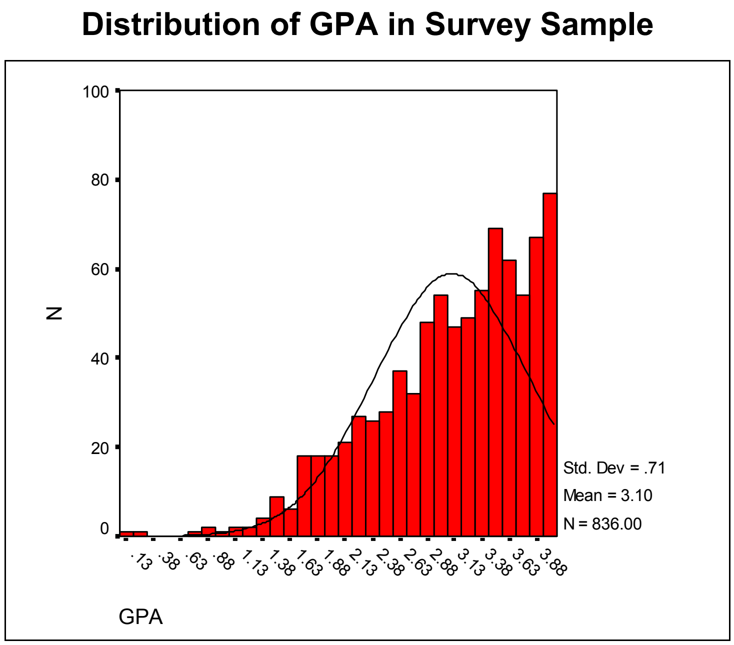
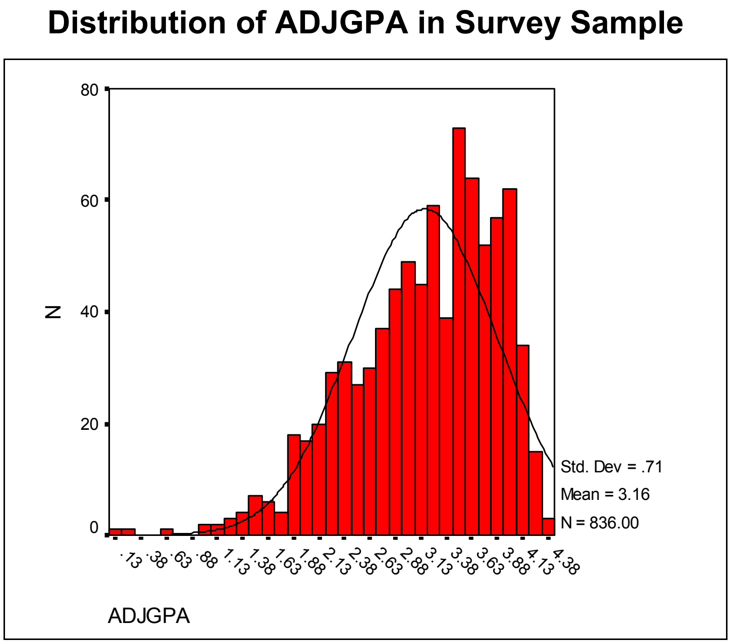


Figure 4.11



Distribution of GPA in Survey Sample
100
80
60
40
20
0
N
.13
.38
.63
.88
1.13
1.38
1.63
1.88
2.13
2.38
2.63
2.88
3.13
3.38
3.63
3.88
GPA
Std. Dev = .71
Mean = 3.10
N = 836.00

Figure 4.12



Distribution of ADJGPA in Survey Sample
80
60
40
20
0
N
Std. Dev = .71
Mean = 3.16
N = 836.00
.13 .38 .63 .88 1.13 1.38 1.63 1.88 2.13 2.38 2.63 2.88 3.13 3.38 3.63 3.88 4.13 4.38
ADJGPA

Table 4.19

Ethnic Intercept Bias in the Prediction of ADJGPA by SATM + SATV + Explanatory Variables

Set	Predictor	B	Std. Error	Beta	t	Sig.
1	(Constant)	.813	.183		4.445	.000
	SATM	.003	.000	.359	9.354	.000
	SATV	.001	.000	.091	2.365	.018
2	HONORS	.036	.017	.064	2.139	.033
	ABILITY	-.008	.007	-.036	-1.160	.246
	PEER	.001	.008	.002	.067	.947
	FEAR	.008	.007	.036	1.150	.250
	PATTAIN	-.030	.029	-.032	-1.037	.300
	DISTRACT	.008	.014	.017	.580	.562
	ATTEND	.152	.017	.272	8.762	.000
	NOTES	-.044	.027	-.052	-1.660	.097
	STUDY	.124	.021	.185	5.844	.000
3	White	.042	.050	.030	.845	.398
	Mex-Am	-.187	.068	-.096	-2.774	.006

Dependent Variable: ADJGPA; Standard Deviation of ADJGPA: .71

Table 4.20

Ethnic Intercept Bias in the Prediction of ADJGPA by SATM + SATV + HSPR + Explanatory Variables

Set	Predictor	B	Std. Error	Beta	t	Sig.
1	(Constant)	.813	.183		4.445	.000
	SATM	.003	.000	.359	9.354	.000
	SATV	.001	.000	.091	2.365	.018
2	HSPR	.025	.002	.319	10.775	.000
3	HONORS	.011	.016	.020	.697	.486
	ABILITY	-.003	.007	-.013	-.457	.648
	PEER	.000	.008	-.001	-.035	.972
	FEAR	.004	.007	.017	.575	.565
	PATTAIN	-.024	.028	-.026	-.881	.379
	DISTRACT	.010	.013	.022	.770	.441
	ATTEND	.130	.017	.233	7.767	.000
	NOTES	-.032	.026	-.038	-1.250	.212
	STUDY	.115	.020	.172	5.678	.000
4	White	.041	.047	.028	.857	.392
	Mex-Am	-.235	.064	-.120	-3.639	.000

Dependent Variable: ADJGPA; Standard Deviation of ADJGPA: .71

in prediction equations where SATM, SATV, and HSPR are used in combination with the set of explanatory variables actually increases the amount of Mexican-American over-prediction (see Tables 4.19 and 4.20). In the equation using only SATM and SATV, intercept bias increased from d=.21 (p=.026) to d=26 (p=.006). Using SATM, SATV, and HSPR together, the intercept bias increased from d=.28 (p=.002) to d=.33 (p<.001).

Analysis of Intercept Bias in the Gender Context

Tables 4.21 and 4.22 illustrates the relationships between GPA and the standard predictor variables in the survey dataset for each gender. The total SAT scores of male students are approximately 1/3 of a standard deviation higher than those of females, being higher on both the SATM and SATV scales. The high school percentile ranks are similar, with females graduating high school on average 1 percentile above males. College GPAs are not significantly different (t=.756, p=.450).

SATM accounts for similar proportions of the variance in GPA for males and females, though SATV accounts for approximately twice as much variance in GPA for females than for males. HSPR accounts for slightly more variance in female GPA (.15 vs. .14). Combined, the SATM, SATV, and HSPR account for .30 of the variance in female GPA and for .28 of the variance in male GPA.

With regard to intercept bias, SATM over-predicts the performance of males substantially (d=.26, p<.001), though neither SATV nor HSPR do (see

Figures 4.13-4.15 and Tables 4.23-4.25). The combination of SATM, SATV over-predicts for males ($d=.25$, $p<.001$) but with the inclusion of HSPR, the amount of over-prediction is reduced ($d=.20$, $p=.001$) as shown in Tables 4.26 and 4.27. There are no significant slope differences for any of these predictors or combinations.

According to the hypothesis, including the set of explanatory variables in the prediction equation will reduce or eliminate intercept bias. Tables 4.28 and 4.29 and Figure 4.16 list the average scores for each gender on the nine variables included on the student survey. Effect size for the average differences between genders varied widely from $d=.04$ for parental desire for child's educational attainment, to $d=.44$ for the belief in ability over effort in achieving academic success (females favored effort). As illustrated in Tables 4.30 and 4.31, the inclusion of these variables as a set into a regression equation where SATM and SATV are entered first results in some decrease in male over-prediction. Intercept bias decreases from $d=.25$ ($p<.001$) to $d=.16$ ($p=.014$) with the addition of the explanatory set. When the regression equation originally includes SATM, SATV, and HSPR, if the explanatory set is entered, the intercept bias decreases insignificantly from $d=.20$, ($p=.001$) to $d=.13$ ($p=.030$).

A final consideration is the consequence of employing the adjusted GPA as described in the preceding section. When adjusted GPA is used as the dependent variable and SATM and SATV are predictors, intercept bias decreases slightly from d=.25 (p<.001) to .20 (p=.002). Yet with the further inclusion of the explanatory set, as shown in Tables 4.32 and 4.33, intercept bias is reduced to insignificance (d=.09, p=.137). Also, when the regression equation originally includes SATM, SATV, and HSPR, with adjusted GPA is the dependent variable, males are over-predicted by d=.15 (p=.016). Once the explanatory set is entered, intercept bias is further decreased to d=.07 (p=.239). In contrast to the ethnic context, the hypothesis is here supported.

Table 4.21

Gender Group Differences on Standard Predictor Variables and GPA

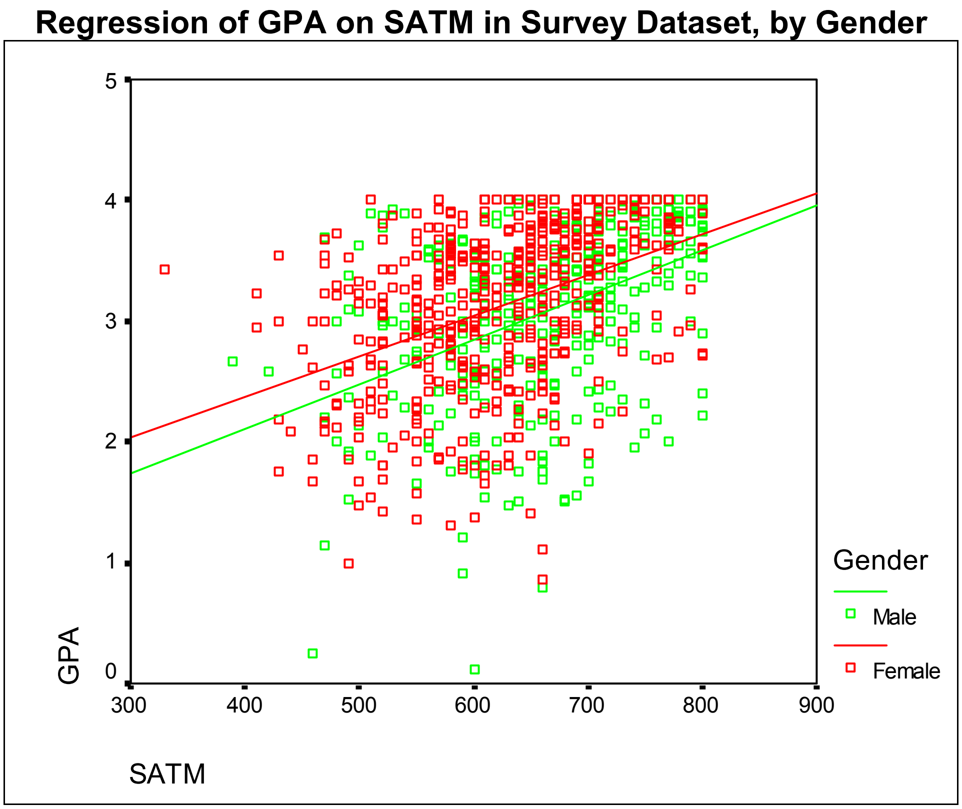
	Female N=471		Male N=365	
Predictor	**Mean**	**S.D.**	**Mean**	**S.D.**
SATM	620	84	662	82
SATV	582	87	603	85
SATT	1203	152	1265	147
HSPR	91.60	8.60	90.52	9.72
GPA	3.12	0.69	3.08	0.73

Table 4.22

Standard Predictors of GPA in Survey Dataset, by Gender

Predictors	Sample	R	R Square	Adjusted R Square	Std. Error of Est.
(Constant), SATM	Total Sample	.393	.155	.154	.6501
	Female	.410	.168	.166	.6255
	Male	.415	.172	.170	.6688
(Constant), SATV	Total Sample	.291	.085	.084	.6764
	Female	.341	.116	.114	.6446
	Male	.242	.059	.056	.7132
(Constant), SATM, SATV	Total Sample	.401	.161	.159	.6480
	Female	.429	.184	.180	.6202
	Male	.416	.173	.168	.6695
(Constant), HSPR	Total Sample	.379	.144	.143	.6542
	Female	.387	.150	.148	.6323
	Male	.370	.137	.135	.6829
(Constant), HSPR, SATV, SATM	Total Sample	.529	.280	.278	.6006
	Female	.548	.300	.296	.5749
	Male	.530	.281	.275	.6251

Figure 4.13



Regression of GPA on SATM in Survey Dataset, by Gender
5
4
3
2
1
0
GPA
300
400
500
600
700
800
900
SATM
Gender
Male
Female

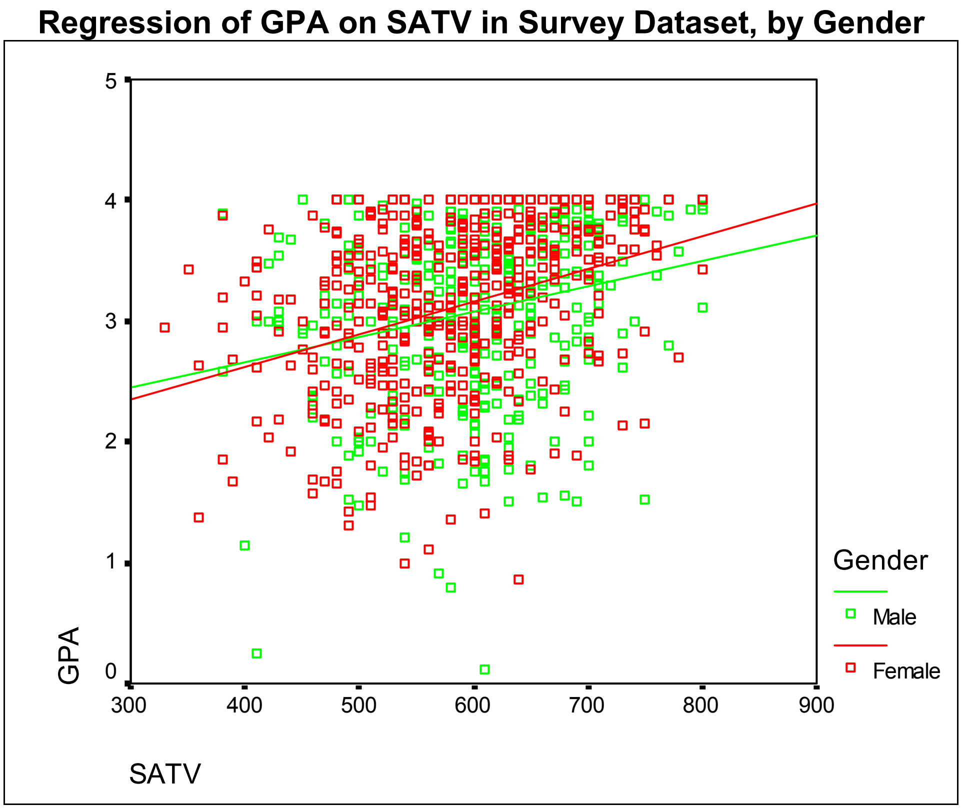
Table 4.23

Gender Intercept and Slope Bias from SATM

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	Male	-.183	.046	-.128	-3.944	.000
Slope	Male x SATM	.000	.001	.160	.625	.532

Dependent Variable: GPA; S.D.=.71

Figure 4.14



Regression of GPA on SATV in Survey Dataset, by Gender
GPA
SATV
0
1
2
3
4
5
300
400
500
600
700
800
900
Gender
Male
Female

Table 4.24

Gender Intercept and Slope Bias from SATV

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	Male	-.087	.047	-.061	-1.832	.067
Slope	Male x SATV	-.001	.001	-.256	-1.078	.281

Dependent Variable: GPA; S.D.=.71

Figure 4.15

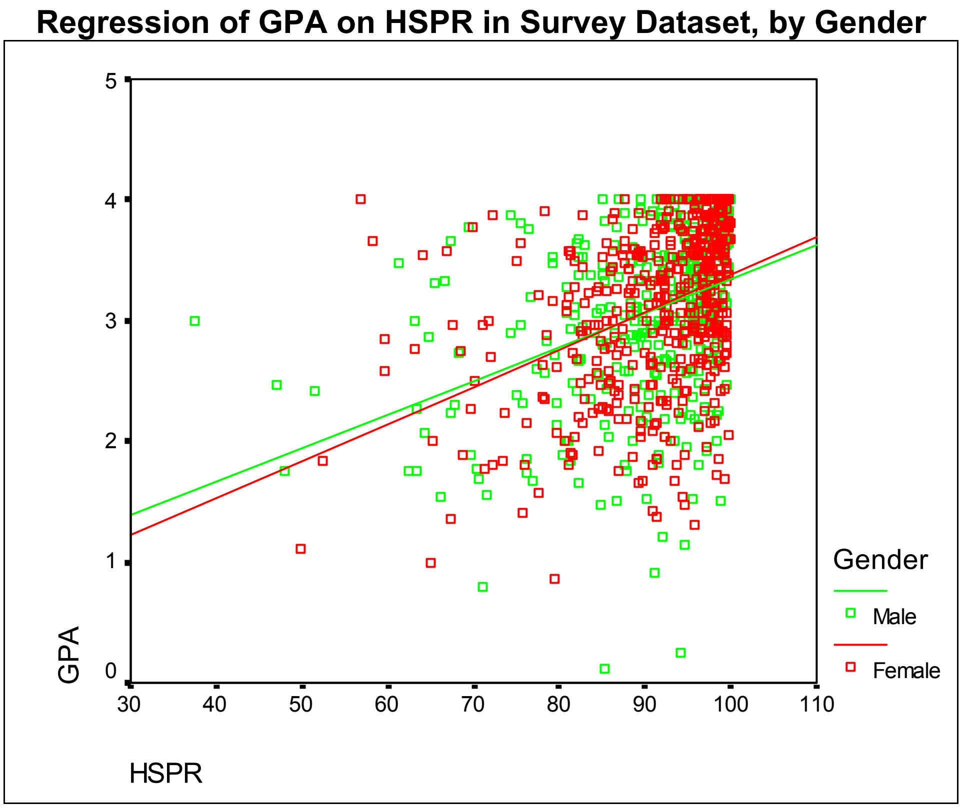

Regression of GPA on HSPR in Survey Dataset, by Gender
GPA
HSPR
0
1
2
3
4
5
30
40
50
60
70
80
90
100
110
Gender
Male
Female

Table 4.25

Gender Intercept and Slope Bias from HSPR

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	Male	-.005	.046	-.004	-.120	.905
Slope	Male x HSPR	-.003	.005	-.185	-.580	.562

Dependent Variable: GPA; S.D.=.71

Table 4.26

Gender Intercept and Slope Bias in the Prediction of GPA by SATM + SATV

Paramete		B	Std. Error	Beta	t	Sig.
Intercept	Male	-[illegible]	.046	-[illegible]	-[illegible]	.000
Slope	Male x SATM	.001	.001	.451	1.468	.142
	Male x SATV	-[illegible]	.001	-[illegible]	-[illegible]	.112

Dependent Variable: GPA; Standard Deviation of GPA: .71

Table 4.27

Gender Intercept and Slope Bias in the Prediction of GPA by SATM + SATV + HSPR

Parameter		B	Std. Error	Beta	t	Sig.
Intercept	Male	-.139	.043	-.098	-3.233	.001
Slope	Male x SATM	.001	.001	.397	1.386	.166
	Male x SATV	-.001	.001	-.361	-1.424	.155
	Male x HSPR	-.002	.005	-.151	-.516	.606

Dependent Variable: GPA; Standard Deviation of GPA: .71

Table 4.28

Explanatory Variables as Predictors of GPA in Survey Dataset, by Gender

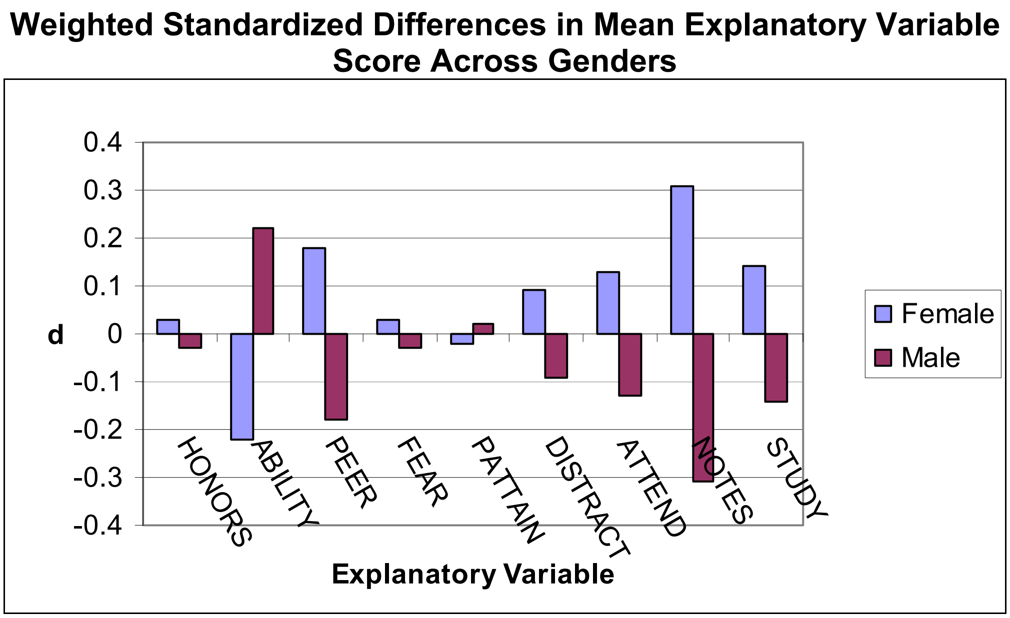
Predictors	Sample	R	R Square	Adj. R Sq.	Std. Error	F	Sig.
(Constant), HONORS	Total Sample	.158	.025	.024	.698	21.242	.000
	Female	.158	.025	.023	.677	11.980	.001
	Male	.156	.024	.022	.726	9.068	.003
(Constant), ABILITY	Total Sample	.020	.000	-.001	.707	.340	.560
	Female	.009	.000	-.002	.686	.040	.842
	Male	.022	.000	-.002	.735	.171	.680
(Constant), PEER	Total Sample	.037	.001	.000	.707	1.154	.283
	Female	.022	.000	-.002	.686	.222	.638
	Male	.046	.002	-.001	.734	.767	.382
(Constant), FEAR	Total Sample	.091	.008	.007	.704	7.037	.008
	Female	.112	.012	.010	.681	5.922	.015
	Male	.064	.004	.001	.734	1.498	.222
(Constant), PATTAIN	Total Sample	.036	.001	.000	.707	1.070	.301
	Female	.020	.000	-.002	.686	.191	.662
	Male	.103	.011	.008	.731	3.876	.050
(Constant), DISTRACT	Total Sample	.002	.000	-.001	.707	.002	.961
	Female	.038	.001	-.001	.685	.676	.411
	Male	.048	.002	.000	.734	.855	.356
(Constant), ATTEND	Total Sample	.273	.075	.073	.680	67.157	.000
	Female	.254	.065	.063	.663	32.396	.000
	Male	.291	.085	.082	.703	33.518	.000
(Constant), NOTES	Total Sample	.038	.001	.000	.707	1.180	.278
	Female	.023	.001	-.002	.686	.254	.615
	Male	.074	.006	.003	.733	2.019	.156
(Constant), STUDY	Total Sample	.244	.059	.058	.686	52.591	.000
	Female	.223	.050	.048	.669	24.444	.000
	Male	.265	.070	.067	.709	27.339	.000

Table 4.29

Gender Group Differences on Explanatory Variables

	Female N=471			Male N=365		
Predictor	**Mean**	**S.D.**	**d**	**Mean**	**S.D.**	**d**
HONORS	2.06	1.29	0.03	1.99	1.29	-0.03
ABILITY	14.48	2.97	-0.22	15.81	3.02	0.22
PEER	11.73	2.48	0.18	10.81	2.69	-0.18
FEAR	18.57	3.13	0.03	18.38	2.92	-0.03
PATTAIN	2.35	0.75	-0.02	2.39	0.77	0.02
DISTRACT	4.85	1.56	0.09	4.58	1.51	-0.09
ATTEND	3.21	1.17	0.13	2.88	1.37	-0.13
NOTES	2.64	0.77	0.31	2.14	0.84	-0.31
STUDY	3.19	1.03	0.14	2.89	1.10	-0.14

Figure 4.16



Weighted Standardized Differences in Mean Explanatory Variable Score Across Genders
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
d
HONORS
ABILITY
PEER
FEAR
PATTAIN
DISTRACT
ATTEND
NOTES
STUDY
Explanatory Variable
Female
Male

Table 4.30

Gender Intercept Bias in the Prediction of GPA by SATM + SATV + Explanatory Variables

Model	Predictor	B	Std. Error	Beta	t	Sig.
1	(Constant)	.848	.183		4.637	.000
	SATM	.003	.000	.337	8.708	.000
	SATV	.001	.000	.098	2.536	.011
2	HONORS	.030	.017	.053	1.742	.082
	ABILITY	-.008	.007	-.033	-1.075	.283
	PEER	.003	.008	.011	.369	.712
	FEAR	.008	.007	.034	1.080	.281
	PATTAIN	-.041	.029	-.044	-1.424	.155
	DISTRACT	.015	.014	.033	1.097	.273
	ATTEND	.162	.017	.291	9.272	.000
	NOTES	-.047	.027	-.056	-1.756	.079
	STUDY	.107	.021	.161	5.024	.000
3	Male	-.112	.046	-.079	-2.461	.014

Dependent Variable: GPA; Standard Deviation of GPA: .71

Table 4.31

Gender Intercept Bias in the Prediction of GPA by SATM + SATV + HSPR + Explanatory Variables

Model	Predictor	B	Std. Error	Beta	t	Sig.
1	(Constant)	.848	.183		4.637	.000
	SATM	.003	.000	.337	8.708	.000
	SATV	.001	.000	.098	2.536	.011
2	HSPR	.027	.002	.346	11.731	.000
3	HONORS	.002	.016	.004	.122	.903
	ABILITY	-.002	.007	-.008	-.288	.773
	PEER	.002	.008	.008	.273	.785
	FEAR	.003	.007	.013	.437	.662
	PATTAIN	-.035	.027	-.038	-1.278	.202
	DISTRACT	.017	.013	.038	1.345	.179
	ATTEND	.137	.017	.247	8.242	.000
	NOTES	-.033	.025	-.040	-1.312	.190
	STUDY	.097	.020	.146	4.828	.000
4	Male	-.094	.043	-.066	-2.177	.030

Dependent Variable: GPA; Standard Deviation of GPA: .71

Table 4.32

Gender Intercept Bias in the Prediction of ADJGPA by SATM + SATV + Explanatory Variables

Model	Predictor	B	Std. Error	Beta	t	Sig.
1	(Constant)	.813	.183		4.445	.000
	SATM	.003	.000	.359	9.354	.000
	SATV	.001	.000	.091	2.365	.018
2	HONORS	.036	.017	.064	2.139	.033
	ABILITY	-.008	.007	-.036	-1.160	.246
	PEER	.001	.008	.002	.067	.947
	FEAR	.008	.007	.036	1.150	.250
	PATTAIN	-.030	.029	-.032	-1.037	.300
	DISTRACT	.008	.014	.017	.580	.562
	ATTEND	.152	.017	.272	8.762	.000
	NOTES	-.044	.027	-.052	-1.660	.097
	STUDY	.124	.021	.185	5.844	.000
3	Male	-.068	.046	-.047	-1.488	.137

Dependent Variable: ADJGPA; Standard Deviation of ADJGPA: .71

Table 4.33

Gender Intercept Bias in the Prediction of ADJGPA by SATM + SATV + HSPR + Explanatory Variables

Model	Predictor	B	Std. Error	Beta	t	Sig.
1	(Constant)	.813	.183		4.445	.000
	SATM	.003	.000	.359	9.354	.000
	SATV	.001	.000	.091	2.365	.018
2	HSPR	.025	.002	.319	10.775	.000
3	HONORS	.011	.016	.020	.697	.486
	ABILITY	-.003	.007	-.013	-.457	.648
	PEER	.000	.008	-.001	-.035	.972
	FEAR	.004	.007	.017	.575	.565
	PATTAIN	-.024	.028	-.026	-.881	.379
	DISTRACT	.010	.013	.022	.770	.441
	ATTEND	.130	.017	.233	7.767	.000
	NOTES	-.032	.026	-.038	-1.250	.212
	STUDY	.115	.020	.172	5.678	.000
4	Male	-.051	.044	-.036	-1.178	.239

Dependent Variable: ADJGPA; Standard Deviation of ADJGPA: .71

Chapter V: Discussion

The initial and primary purpose of this study was to examine whether group differences in a set of cultural and socio-cognitive variables (jointly termed “explanatory variables”) can account for the standard pattern of intercept bias that is often observed among ethnic groups when college freshman academic performance (GPA) is predicted by the SAT verbal and quantitative scores. A secondary purpose was to examine whether the same explanatory variables can account for the frequently observed pattern of intercept bias observed between men and women when the SATs are used to predict college performance.

In summary, while the expected pattern of Mexican-American overprediction was observed in these data, the often-reported pattern of Asian-American underprediction generally was not found. Inclusion of the explanatory variables in prediction equations employing the standard predictor variables had no effect on intercept bias vis-à-vis Asian-Americans relative to Whites, nor did it have an effect on reducing the overprediction of Mexican-American student performance.

As expected, female underprediction was observed relative to males, and this was greatly reduced by including the explanatory variables in the prediction equation. Further, when an adjusted measure of GPA was substituted for GPA as the dependent variable, the underprediction was rendered statistically insignificant. Although many prior investigations have reported underprediction of female academic performance by the SAT, until now no study has been able to account for the underprediction completely using a combination of grade adjustments and additional explanatory variables.

INTERCEPT BIAS AND ASIAN-AMERICANS

In the current study, the expected pattern of Asian-American underprediction did not occur relative to Whites, either in the survey sample dataset, or the much larger entire dataset provided by the University's Measurement and Evaluation Center (MEC), (although a very small underprediction of Asian-American grades (approximately 0.05 S.D.) was found in two subsets of the MEC data). Essentially though, in this study Whites and Asians were indistinguishable in how the SATs and HSPR predict freshman GPA.

Why might this be? If the survey sample were the only data to base prospective answers on, it might be argued that the sample was constricted to only a subset of majors – engineering, science, and business – who do not reflect the full range of students at the University. Thus perhaps it could be the case that including liberal arts, fine arts, and communications majors in the study would have revealed the underprediction of Asian-American performance found so often previously. Yet this scenario seems unlikely because of the evidence revealed in the dataset obtained from the University's Measurement and Evaluation Center (MEC). This dataset allowed for the examination of the grades (though not the GPAs) of virtually all freshmen students at the university. Overall, these grades did not reveal intercept bias and only a very small, though statistically significant ($p=.021$), underprediction relative to Whites in the most popular science courses. However, since the MEC dataset consisted of *all* grades in each of the courses, rather than only freshman grades, it is possible that the non-freshmen grades belong to students might have hidden some amount of intercept bias. This could have occurred if White and Asian-American sophomores and upperclassmen differentially took courses of varying degrees of grading stringency. This might occur, for instance, if White sophomores and upperclassmen students who shared certain characteristics in common with Asian students were more likely to take courses that Asian freshmen took than White sophomores and upperclassmen students who were less likely to share those characteristics in common with Asian freshmen.

There is some reason to believe, however, that, as a whole, the White students in the survey sample might be more similar to their Asian peers in certain respects than might have been the case in prior studies where Asian-American underprediction was reported. The Asian-American students of today may have acculturated more to American life than those in earlier studies reporting Asian-American underprediction. Much of the literature on this issue is based on data collected in the 1980s, before the cohort of students in the present study was in school, or even before they were born. Since it has been found that the immigrant "advantage" in education is drastically reduced or eliminated by the third generation, it could be that these students are further along in that process than were the subjects of earlier studies.

The mean absolute difference between White and Asian-American students on the nine explanatory variables was .27 S.D. The most striking differences were on the perceived parental desire regarding the level of educational attainment of the respondent, and the respondent's fear of academic failure. Asian-American students reported that their parents urged them to attain more education than White students reported. The difference was .71 S.D.; essentially Whites reported a mean parental desire of slightly more than a bachelor's degree; for Asian-Americans, a mean of slightly less than a master's degree was reported.

These results above echo patterns that have been found many times before in studies of Asian-American children in primary and secondary school. In contrast to expectation however, there were no significant differences in class attendance or note-taking reported by the Asian-American and White students in this sample, although Asian-Americans did report spending significantly more time studying than White students.

Most of the prior research done on children's attribution of ability versus effort in academic success has shown that Asian and Asian-American students (and parents) are more likely to credit effort instead of ability. It has been posited that attributing success to effort is more likely to produce behaviors that lead to academic success, since students who credit ability may be less likely to believe that getting good grades is within their control and work to achieve those grades. In the present study, however, Asian-American students were .22 S.D. *more* likely than Whites to credit ability (p=.004). As discussed earlier, at least two prior studies found no Asian/White differences in attribution, but none have found a reversal of the commonly found pattern.

In regard to the remaining explanatory variables, as expected, Asian-American students took a significantly greater number of advanced high school science courses, enjoyed greater support from peers, and were less distracted from their academic work by social engagements and outside jobs.

INTERCEPT BIAS AND MEXICAN-AMERICANS

As anticipated based on the weight of prior research, SATM, SATV, HSPR, and combinations thereof all resulted in overprediction of the grades and GPAs of Mexican-American students. But in contradiction to the main hypothesis of this investigation, the inclusion of the explanatory variable set in the prediction equation did not result in a significant decrease in the amount of overprediction.

Interpretation of the data was complicated, however, by the existence of a ceiling effect in GPA that was found in all three ethnic groups, but which was less pronounced among Mexican-Americans. GPA in the survey sample overall was negatively skewed -0.79 and the mean GPA in the sample was 3.1 on a 4-point scale, corresponding to a B, although the University officially regards a 2.0 or C as an “average” grade and B as “superior.” The current grading distribution appears to be the consequence of several decades of grade inflation that has reduced the B to a grade indicating average performance rather than superior performance. The ceiling effect was especially problematical because it appeared more strongly in the Asian-American and White GPA distribution than in the Mexican-American GPA distribution. Because the 4-point scale capped the performance range of the former groups, it might have capped the relationships between actual performance and the predictor variables, calling into question whether the sample data provide an adequate test of the hypothesis.

It was possible however to mitigate the ceiling effect by employing an adjusted measure of academic performance that extended the maximum possible GPA beyond 4.0 and corrected for some of the grading standard differences that exist between courses, departments, and colleges. As shown in Figures 4.9-4.12, the use of the adjusted GPA mitigated the ceiling effect substantially, and extended the range of the dependent variable from 3.88 to 4.22.

When the adjusted GPA was substituted for GPA in analyses, no reduction in overprediction of Mexican-American performance was observed, either with or without the inclusion of the explanatory variable set, despite the fact that Mexican-Americans did differ from the other groups by an average of .15 standard deviations across the variable set. With regard to specific variables in the set, Mexican-Americans were .26 S.D. more likely than average to endorse the view that effort rather than ability is the more important determinant of academic success. When asked about how far educationally their parents expected them to go, their responses were .23 S.D. lower than the average of the three groups, and their self-reported fear of academic failure was .21 S.D. lower. However they did report taking more class notes than average (.22 S.D. more).

INTERCEPT BIAS AND GENDER

As anticipated based on the weight of prior research, SATM, SATV, HSPR, and combinations thereof all resulted in underprediction of the grades and GPAs of women students relative to men. As hypothesized, the inclusion of the explanatory variable set in the SAT prediction equation resulted in a decrease in the amount of underprediction from .18 to .11 (from p=.000 to p=.014). When the adjusted GPA was substituted for GPA in analyses, the intercept bias was rendered insignificant at the .05 level (p=.137).

The reduction of gender intercept bias by including explanatory variables similar to the ones used in the present study has been shown before. Likewise, the use of GPA adjustment methods have also been shown to reduce gender intercept bias. But to date, no study has combined the two approaches or found that gender intercept bias would be eliminated by a combination of these approaches. In the current sample, it seems to be the case that the observed intercept bias is a consequence of both socio-cognitive variables and differential course-taking.

The mean absolute difference between men and women on the set of explanatory variables was .26 S.D. The greatest differences regarded the attribution of effort over ability as primarily responsible for academic achievement (.44 S.D. above men); classroom note-taking (.62 S.D. above men); peer support (.36 S.D. above men); class attendance (.26 S.D. above men); and time spent studying (.28 S.D. above men). Bridgeman & Wedler (1991) speculated that some of these variables might account for the gender intercept bias found in their study of college mathematics grades. Their conjecture is supported by the data in the present study.

LIMITATIONS OF THE STUDY AND IMPLICATIONS FOR FUTURE RESEARCH

From a theoretical perspective, an ideal study of intercept bias would include survey and admissions data from large numbers of students across all curricula and would obtain subjects from a wide variety of institutions and institution types. It would be a study in which the range of each predictor variable would be minimally restricted, so that the most complete understanding of the relationships among variables could be analyzed.

Yet from a more practical perspective, an ideal study of intercept bias would need to include only students from certain types of institutions (such as large state universities or prestigious private colleges) where the SAT is employed as a major component in admissions decisions. The present study was intended to address and explore intercept bias as might be found at other large state universities with moderately competitive undergraduate admissions and similar academic standards. At such schools, the SATs and high school records of admittees are restricted to the upper reaches of the distributions of those variables. The implications of intercept bias, in terms of its impact on ethnic diversity, issues of equity, and the academic success of students, are important questions in and of themselves, apart from theoretical considerations.

It is from the second perspective that the present study was conceived and executed. Operating from within that framework, it would have been preferable to have obtained a greater number of Mexican-American students and an analyzable number of African American students. Data from several institutions would need to be collected in order to minimize the contribution of any unique factors operating at a particular institution. Additionally, improved measures of some of the explanatory variables would be preferable. The Cronbach's alphas of some of the items scales should be higher, for example. Further, self-report of such items as study habits and class attendance may not be as reliable as desired, especially considering the possibility that demand characteristics were being imposed on participants.

Also, out of practical necessity, the survey was administered in the spring semester. This is less than ideal because some amount of attrition (approximately 2%) has occurred between the fall and spring semesters, a factor which might operate differentially among various ethnic groups and between the genders in some manner related to intercept bias. Despite the limitations of the design and instruments, the study was capable of finding support for the hypothesis regarding gender intercept bias, although it is unknown whether the failure to find support for the hypothesis regarding Mexican-American overprediction was due to limitations of the study itself.

In the absence of evidence to support the hypothesis regarding Mexican-American overprediction however, alternative hypotheses should be considered. Relevant factors that might be operative in Mexican-American freshmen (and African American freshmen) include additional stresses that are not faced by White and Asian-American students. One issue that Mexican-American students in the present study must deal with to a greater extent than Whites or Asian-Americans is the change in their academic competitiveness vis-à-vis their new peers. Although White, Asian-American and Mexican-American students on average possess comparable high school records, an inordinate proportion of Mexican-American freshmen hail from underperforming high schools. It is thus possible that having to confront a reduction in academic status relative to their college classmates is somehow a factor in overprediction. Perhaps this change is discouraging to those students who must face it. Or perhaps these students simply continue with the study habits that led to success in low performing high schools but which are inadequate at the University.

Another explanation for Mexican-American overprediction involves the possibility that many of these freshmen must navigate the challenges posed by adjusting to college without guidance from parents who are familiar with higher education or as certain of the benefits of strong academic performance as Asian-American and White parents are. Most Asian-American immigrants to the United States have come from countries such as Japan and China, where education was highly coveted as a means of social advancement. In contrast, the advantages of higher education may not have been so profound or so available for the ancestors of Mexican-American students, many of whom worked in a largely agrarian society where advanced education was simply unattainable.

Whatever the reason, Mexican-American overprediction, which in earlier decades was often referred to as underachievement, is an issue that deserves further study because of its consequences for the students and for society at large.. Although affirmative action programs might make it easier for Mexican-American students to obtain jobs or acceptance to graduate programs, these measures cannot erase the deficits in skills that accumulate with continued underachievement. Hence, the matter remains a pertinent topic of investigation.

Appendix

The version of the survey instrument included on the following pages was distributed to the 2^{nd} year cohort, data from which the analyses were conducted. The version presented is a revision of the one used in the 1^{st} year pilot study.

2001-2002 First-Year Student Survey

Permission to Access Student Records

I give permission for the Office of the Registrar to release the following information to the researchers of the 2001-2002 First-Year Student Survey: course and grade information contained on my UT grade reports, my high school class rank and size, and my SAT scores. I understand that this information will be used only for the purpose of analyzing and improving UT student performance and that all information will be kept confidential to the maximum extent possible. Every effort will be made to insure that the information, as well as all my responses given to this survey, will be known only to the researchers and to their qualified assistants. <u>No one else</u> will be allowed access to any of the personally identifiable information I provide.

Name (printed): ____

Signature: ____

Social Security #: ___/___/___ ___/___ ___/___/___/___

Date: ____

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IMPORTANT! Before you continue, write your social security number **here**: ______-____-________

As an incentive to complete this survey and return it, you are invited to participate in drawings for three gift certificates. **One $300** winner and **two $100** winners will be selected from among the **completed** returned surveys. If you win, to which merchant would you like to receive your gift certificate?

A. Foley's Department Store
B. The University Co-op
C. Border's Books and Music
D. REI Sports Equipment Store
E. CompUSA

Part 1 (1-20)—Directions: This survey contains statements on **what you think, what you do,** and **how you feel** about certain things related to school. For each question **choose the ONE response** that best describes you. If you think the statement is very true, mark the letter D. If the statement is more or less true of you, mark the letter between A and D that best describes you. If the statement is not at all true, mark the letter A (false). **There are no right or wrong responses**.

1. I try to succeed in school to please my family.

   A - False   B - Mostly False   C - Mostly True   D – True

2. Some people are born good learners. Others are just stuck with their limited ability.

   A - False   B - Mostly False   C - Mostly True   D - True

3. I feel that doing poorly in school will greatly hurt my chances for a good job.

   A - False   B - Mostly False   C - Mostly True   D - True

4. Genius is 10% ability and 90% hard work.

   A - False   B - Mostly False   C - Mostly True   D - True

5. If you are ever going to be able to understand something, it will make sense to you the first time.

   A - False   B - Mostly False   C - Mostly True   D - True

6. My classmates and I rarely help each other with homework.

   A - False   B - Mostly False   C - Mostly True   D - True

7. My parents expect me to be one of the best students in my classes.

   A - False   B - Mostly False   C - Mostly True   D - True

8. My friends and I rarely encourage each other to do well in school.

   A - False   B - Mostly False   C - Mostly True   D - True

9. Most of what you can learn from a difficult book you can't get during the first reading.

   A - False   B - Mostly False   C - Mostly True   D - True

10. The really smart students don't have to work hard to do well in school.

    A - False   B - Mostly False   C - Mostly True   D - True

11. I sometimes do my homework, but it does not bother me if I don't complete it.

    A - False   B - Mostly False   C - Mostly True   D – True

12. I feel that if I don't do well in school I can still get the job I want.

    A - False   B - Mostly False   C - Mostly True   D – True

13. My classmates and I often share class notes and materials with one another.

    A - False   B - Mostly False   C - Mostly True   D – True

14. Students are born with a certain amount of ability that is not changed by hard work.

A - False B - Mostly False C - Mostly True D - True

15. My classmates and I frequently study together for tests.

A - False B - Mostly False C - Mostly True D - True

16. Successful students learn things quickly.

A - False B - Mostly False C - Mostly True D - True

17. My parents do not expect me to get mostly A's at this school.

A - False B - Mostly False C - Mostly True D - True

18. I feel that not doing well in school will disappoint my parents very much.

A - False B - Mostly False C - Mostly True D - True

19. Even when a student does not have the present capability to understand a concept, with enough effort and outside help most students can learn any subject matter.

A - False B - Mostly False C - Mostly True D - True

20. It is often true that a good job follows a bad education.

A - False B - Mostly False C - Mostly True D - True

Part 2 (21-28)—Directions: Please answer the following questions about your high school experience.

21. What year did you graduate from high school?
   A. 2001
   B. 2000
   C. 1999
   D. 1998 or before
   E. I obtained a GED instead of finishing high school.

22. What was the size of your graduating class?

A - Fewer than 100 B - 100 to 249 C - 250-400 D - 0ver 400

23. How would you rate the quality of social life at you're your high school?
   A. Excellent
   B. Better than average
   C. Average
   D. Below average
   E. Poor

24. How would you rate the quality of education offered by your high school?
   A. Excellent
   B. Better than average
   C. Average
   D. Below average
   E. Poor

25-28. Did you complete any of the following special science and math courses (if your high school offered them).

	Yes	**No**	**Not Offered**
25. Advanced Placement or Honors Calculus	☐	☐	☐
26. Advanced Placement or Honors Biology	☐	☐	☐
27. Advanced Placement or Honors Chemistry	☐	☐	☐
28. Advanced Placement or Honors Physics	☐	☐	☐

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Part 3 (29-36) —Directions: The following questions are about behaviors, attitudes, and goals this semester at UT. **For each statement select ONE response.**

29. This semester, how often do you have a social engagement (date, club meeting, etc.)?
    A. Under one time per month on average
    B. Under one time per week on average
    C. 1 or 2 times per week
    D. 3 or 4 times per week
    E. 5 or more times per week

30. This semester, how many hours per week do you work at a job for pay?
    A. None, I am not working this semester.
    B. 1-7
    C. 8-11
    D. 12-15
    E. 16-20
    F. more than 20

31. If you do work at a job for pay, what is your primary reason for doing so?
    A. Not applicable to me – I am not working this semester.
    B. to obtain spending money
    C. to help pay for college
    D. to help out my family
    E. because I like the job

32. Except for illnesses, have you ever missed classes this semester?
    A. Yes, more than 10 classes
    B. Yes, around 7-10 classes
    C. Yes, around 4-6 classes
    D. Yes, around 1-3 classes
    E. No, I have missed no classes this semester.

33. On average, how many pages of notes do you take in a typical class?
    A. About 1 page or less
    B. About 2 pages per class
    C. About 3 pages per class
    D. About 4 or more pages per class

34. On average, how many hours per week do you study?
    A. 3 or fewer
    B. 4-5
    C. 6-11
    D. 12-23
    E. 24 or more

35. What is the minimum GPA this semester that would be personally acceptable to you?
    4.0   3.99 to 3.75   3.74 to 3.5   3.49 to 3.2   3.19 to 3.0   2.99 or below

36. What is the minimum level of education your parents would be satisfied with you attaining?
    A. an associate's degree
    B. a bachelor's degree
    C. a master's degree
    D. a Ph.D., MBA, MD, or law degree

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Part 4 (37-45)—Directions: For each item, choose the best answer that applies to you. (Choose only one answer per item.)

37. **Your gender** A - Male B - Female

38. **Your age** A - 18 B - 19 C - 20 D - 21 or older

39. **Father's level of education**
A. Less than high school B. High school diploma C. Some college D. College degree E. Graduate degree

40. **Mother's level of education**
A. Less than high school B. High school diploma C. Some college D. College degree E. Graduate degree

41. **Is English the language spoken by your parents at home?**
A. Always B. Most of the time C. Some of the time D. Rarely E. Never

42. **How many years has your family lived in the United States?**
A. less than 5 years B. 5-10 years C. 11-20 years D. 21-30 years E. More than 30 years.

43. **Which of the following best describes your ethnic background?**
A. Asian / Asian American B. Hispanic / Latino C. African-American D. Caucasian E. Other:________________

44. **If you answered A to question 43, which of the following groups best describes your ancestry?**
A. Chinese or Korean
B. Filipino or Pacific Islander
C. Japanese
D. Vietnamese, Cambodian, or Southeast Asian
E. Indian, Pakistani, Bangladeshi, or Sri Lankan
F. Middle Eastern or Arab
G. Other - Please specify: ___________________

45. **If you answered B to question 43, which of the following best describes your ancestry?**
A. Mexican
B. Cuban
C. Puerto Rican
D. Central American
E. South American
F. Other - Please specify: ___________________

(End of Survey —thank you for your time and your hard work.)

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VITA

Wesley David Wynne was born in Eastland County, Texas on April 29, 1965 and graduated from Eastland High School before proceeding to the University of Texas, where he graduated *summa cum laude* in 1988 with a bachelor's degree in psychology. He continued his education at the University of Michigan, where he was awarded a master's degree in psychology in 1990. After working for the Texas Department of Mental Health and teaching at Austin Community College, he entered the Ph.D. program in psychology. After completing coursework, he lived in San Antonio, Texas for two years and worked in the media industry before moving to Wilmington, Delaware, where he served as a program director and then director of research for an educational non-profit organization. He returned to Texas in the fall of 2002 to complete his dissertation.

Permanent address: 215 W. Main Apt. 207, Ranger, Texas 76470

This dissertation was typed by the author.